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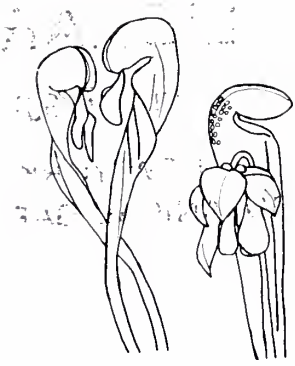
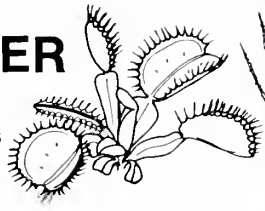
CARNIVOROUS PLANT NEWSLETTER

VOLUME 19, Numbers 1 & 2 MARCH & JUNE 1990



CARNIVOROUS PLANT NEWSLETTER

Official Journal of the International Carnivorous Plant Society



Volume 19, Numbers 1 & 2
March & June 1990

Front cover: *Heliamphora heterodoxa* in habitat. Photos by A. Wistuba. See article beginning on page 44.

Rear cover: *H. ionasi* in habitat on Ilu-tepui.

The co-editors of CPN would like everyone to pay particular attention to the following polices regarding your dues to the ICPS.

All Correspondence regarding dues, address changes and missing issues should be sent to ICPS c/o Fullerton Arboretum, CSUF, Fullerton, CA 92634. DO NOT SEND TO THE CO-EDITORS. Checks for subscription and reprints should be made payable to ICPS.

All material for publication, comments and general correspondence about your plants, field trips or special noteworthy events relating to CP should be directed to one of the co-editors. We are interested in all news related to carnivorous plants and rely on the membership to supply us with this information so that we can share it with others.

Views expressed in this publication are those of the authors, not necessarily the editorial staff.

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BOTANICAL GARDEN

Editor's Corner
by
Leo C. Song, Jr.
Acting Business Manager

By this time, you are wondering what happened to CPN. Well, I got married and as a result have less time to devote to CPN. As I mentioned in the last issue, I needed help. Since then, several people have generously committed their time. Joe Talamantes will do the typesetting and layout, both of which take a lot of time and money. He has agreed to do this at no charge! Richard George has agreed to handle inquiries and some of the accounting. Art North will handle all matters concerning the mail list and mail label generation. All of this has taken time to get organized and all of the bugs have not been ironed out, but these folks have my sincere gratitued for their hard work.

With this in mind, the co-editors have decided to issue two double issues this year as a catch-up measure. The next double issue will be out in early December along with the normal renewal notice. We do not anticipate having to raise prices at this time.

In the past, we have been able to keep expenses low, but during the past year, we have had to go to an independent typesetter which almost doubles the cost of producing CPN. Since each press run of CPN is 2,000 copies, we are sitting on a source of potential income. The cost of printing 2,000 copies versus 1,000 is just the cost of the paper and labor of trimming, collating and stapling, which are minimal. The first 1,000 is more expensive due to set-up charges. The December, 1989 issue was the most expensive issue to date due to the added pages, which boosted typesetting charges to over $1,500 ($30/page) not to mention the added color photos. We are in a slight financial bind, but there is an easy way out: Buy the back issues. When the stock of the color CPN is exhausted, they are gone forever as we do not anticipate reprinting them. So a word of advice—buy the backs!

Thank you all for your patience and understanding. Keep those articles coming!

Special Notice

Gordon Snelling (329 1/2 W. Palm Ave., Monrovia, CA 91016) As many of you have heard by now, Patrick Dwyer has resigned as coordinator of the seed bank and I have taken the position with gratitude from the co-editors. For all of you that helped me during this transition. I thank you and a special thanks to Patrick for all his past labors. Although I have been wading through this project for a couple of weeks, there are a couple of reminders which will help me greatly to do this job more efficiently.

1.) When ordering seed, please list substitutions, or at least list species you do not want because it's difficult to improvise.

2.) When sending seed, please remove as much of the other plant material as possible. As I write this, someone sent me a package of seed that was 25% seed and the rest was debris. Please clean up your donations or I may NOT be able to accept it!

3.) The monthly seed bank updates are available but YOU MUST send me a S.A.S.E. or the correct postage. I will NOT send you a list without the postage. To overseas members: I find that two I.R.C.'s don't always cover the airmail postage to your country. The postage sent should equal at least $0.45 U.S.

4.) Starting with the date of this publication, the price for seed packets will now go up to $1.00/packet U.S. dollars. This is now consistent with the rates that our friends in other seed banks are charging. This leads me into the next proposal.

5.) I am directing this statement to all my counterparts in many CP clubs around the world. I would like to start a seed exchange program with other seed banks where excess seed of native plants are exchanged for my excess seed. In this way, we enrich our seed banks with new seed. If you are interested, please contact me and we can work out details of the trade.

International Carnivorous Plant Society
Seed Bank
June 24, 1990

Byblis liniflora, Dionaea muscipula, Drosera binata, D. binata (Coromandel Peninsula New Zealand), *D. binata dichotoma* (5), *D. burkeana, D. burmanni, D. capensis, D. capensis* (narrow leaf), *D. capillaris, D. capillaris* (compact) (3), *D. capillaris* (large) (1), *D. capillaris* (pink flower) (5), *D. capillaris* (white flower) (10), *D. dielsiana* (11), *D. erythrorhiza* (3), *D. erythrorhiza squamosa* (12), *D. glanduligera, D. intermedia* (2), *D. intermedia* (Carolina giant) (10), *D. intermedia* (South Carolina) (15), *D. intermedia* (Tropical ecotype), *D. macrantha, D. macrantha macrantha, D. montana* (3), *D. natalensis* (2), *D. rotundifolia, D. rotundifolia* (B.C.), *D. rotundifolia* (B.C. branched scapes), *D. rotundifolia* (Czech), *D. rotundifolia* (Finland), *D. spathulata* (Kansai) (13), *D. spathulata* (Lovellae) (7), *D. spathulata* (rotundate) (2), *D. stolonifera compacta, D. stolonifera rupicola, Darlingtonia californica, Nepenthes khasiana* (4), *N. reinwardtiana* (2), *N. ventricosa x* sp. *talang* (14), *Pinguicula vulgaris* (16), *Sarracenia alata* (9), *S. flava* (typica), *S. leucophylla, S. leucophylla* (chipoca), *S. purpurea purpurea* (12), *S. purpurea purpurea* (Maine), *S. purpurea purpurea* (Mich. marl fen) (22), *S. rubra rubra* (4), *S. rubra gulfensis* (1), *S. rubra wherryi* (14), *S. x chelsoni* (5), *S. alata x minor* (3), *S. flava x (alata x flava)* (10), *S. (flava x purp) x (flava x purp)* (10), *S. leucophylla x alata or flava* (20), *Utricularia pentadactyla, U.* sp. New Zealand (2), *U. subulata* (4), *U. uliginosa* (2).
For updated information on the Seed Bank inventory, please contact Gordon C. Snelling 321 1/2 W. Palm Ave., Monrovia, CA 91016, USA. Please include S.A.S.E. or return postage. Overseas include 2 international reply coupons (IRS's).

Want Ad

Bill Webber (109 Irene Drive, Vinton, VA 24179-3806).
WANTED TO BUY: Seeds, cutting, plants, etc. of *Sarracenia flava* 'Copper Top', *S. Oreophila* and hybrids, *S. purpurea* ssp. *purpurea forma heterophylla, S. rubra* ssp. *jonesii, S. Leuophylla* 'Yellow Flower', and *Utricularia duseni*. Will trade *Nepenthes*.

News and Views

Keith Allen (715 South 21st Street, Harrisburg, PA 17104-2402) writes:

I read with interest Michael Szesze's Special Request in the September '89 CPN regarding his educational efforts and related development of a "Teacher's Guide to Carnivorous Plants." I feel this is an excellent idea. We spend too much time talking among ourselves, and not enough time carrying the message to the general public.

Unfortunately, plant extinction does not arouse public sympathy in the same way that a cuddly endangered animal does. Carnivorous plants can be used as an appropriate "hook" to bridge this problem. The natural curiosity which people have for carnivorous plants, can be broadened to include discussions of vanishing wetlands and habitat destruction in general.

At the Museum of Scientific Discovery, in Harrisburg, PA (where I am one of the directors) I have presented such programs with CP. At my suggestion, the Museum included a workshop on carnivorous plants in last year's Camp-In programs. Over the course of the year, over 5,000 Girl Scouts participated in these workshops and learned more about carnivorous plants and their habitat. At the conclusion, each person tried his hand at *Drosera* propagation via a leaf cutting which they took home as a souvenir and reminder of what they had learned. I would enjoy hearing about the efforts of others who are similarly attempting to convey our message of mutual concern to the public.

Steve Clemesha (Lot 6, Skinner Close, Avocado Heights, Woolgoolga, NSW 2456, AUSTRALIA) writes:

I accidentally found a new technique for striking cuttings of *Nepenthes*. After cutting, I stand them in a jar of water for 4 - 6 weeks. Some cuttings start roots after this time and others callous well and then are potted and most form roots. I found this method accidentally as I broke a small shoot of *N. alata* while moving on orchid pot. I placed the cutting in a jar of water that was nearby thinking I would pot it later. I did not get around to it until it was well calloused. So I left it there to see what would happen. It formed short roots of about a quarter of an inch and then stopped. This method works for nearly all *Nepenthes* that will grow by cutting. The callous will form in water provided that the container is well shaded. *N. alata* and *N. ventricosa* make roots in water, but others seal themselves off without a lot of callous. I pot when the base is well matured and most cuttings from roots within a short time. I think most *Nepenthes* growers would improve their percentage of strikes with this method.

Siegfried Hart (7858 Weil am Rhein, den 2o.6.89, Wittlinger Str. 5, West Germany) writes:

In the March, 1989 CPN, Steve Lodlow asks, in the section News and Views, for observations of the plantlets on the flower stalk of *Dionaea*.

Since 1986, I have some of such plants in the laboratory, where I work in Switzerland. Every year, there are one or two flowering stalks. If there are two, I cut the second one. When more than one flower has opened, I take with a pincette one of the stamens of one and bring it to the next flower's ovary, because self pollination is impossible. But using the next flower of the same stalk, I always harvested a lot of seed about 6 to 8 weeks later. When the petals starts getting black, the first new plantlets appear at the mainpoint of the stalk division, just as observed by Steve Ludlow. Within about 10 weeks, they have the size of about 2 year old plants with 4 to 6 traps, starting

to make some roots. This is the point when I cut the stalk and set the plants on a peat/sand-mixture with some living sphagnum. With this method, I get 3 - 4 mature plants and some dozen seedlings from 1 flowering stalk. For demonstration, I enclosed a slide. During the above mentioned procedure, the motherplant looks like in winter dormancy. There are only some small traps. After cutting the stalk, it needs only some more 3 - 4 weeks to get bigger traps, and in autumn I am always asked, when I start to give hamburger to the plant. Now there is only to tell that I grow the plants on a northeast window-sill within an aquarium. The temperature in the laboratory ranges between 180°C at night and up to 28°C on hot summer days. Only in the morning hours the temperature reaches up to 35°C when the sun shines directly into the aquarium. During the winder the plants are dormant in spite there are still about 22°C.

In my greenhouse in Germany, I cultivate some dozen mature plants, (seedlings not counted!) from another source. These plants never showed the above described phenomena.

G. J. Hoogenstrijd (Boterdiep 33a, 9712LJ Groningen, The Netherlands) writes:

I am a student who is interested in carnivorous plants. During the years I have tried to contact people all over the world that are interested in carnivorous plants. That is the reason that I am writing this letter and asking you to insert this letter in your publication.

I am a student of environmental science and work in a Botanical Garden as a volunteer. In this garden (the biggest of the Netherlands), I work only at the department of carnivorous plants.

A par of my own collection is situated in this garden. The other part is situated in the town where I live, and in my parents house.

I have different nurseries; some open airplaces, some tropical places, cold greenhouses are places with artificial light.

In the Netherlands, there is a carnivorous plant association which I am vice-chairman. The association has about 70 members and is call Carnivora.

I am interested in exchanging plant material and cultivating plants. If you are interested too, you can write me.

Manachem Keller (Kibbutz Hulda P.B. 154; MP, Enek Sforek, 73255; ISRAEL) writes:

I became a member in the ICPS in March 1988. In this letter I would like to share with you an interesting experiment with the plant *Dionaea*. Experiments like this already published in an article of John D. Beebe, BOT 6A2 144(4) 396-400, A980, but I intend to continue this experiment. I also want to ask for help from you if its possible.

Form me, the beginning in growing these plant's was very hard. Here in Israel there is no place possible to purchase these plants, so I had to start from seeds. The seeds I received from the ICPS seed bank, at the beginning, did not germinate. Later on I tried to germinate them on Murashing and Skoog based medium (MS) for tissue culture supplemented with 3% Sucros and 4% Agar, PH adjusted to 5.8 with KOH 4N. In these conditions I had a very good germination of: *Drosera capensis, D. Aliciaea, D. Spathulata, Byblis liniflora, Pinguicula lusitanicum* and very few seeds of *Dionaea*. The seeds of *Drosera filiformis filiformis, D. burkeana, Utricularia violacea,* and *U. subulata* did not germinate at all (I think they were too old). One month after the germination of *Dionaea*, I moved the plant to another medium supplemented with NAA 0.1 mg/liter and G-BA 1 mg/liter. After three days, I discovered contamination of bacteria, so I had to move the plant to new medium supplemented Kanamycin 300 mg/ml. I was afraid

it would damage the plant, but happily no damage could be seen and the contamination disappeared. In this amount of hormones, the plant grew much faster than before. Two weeks after I added the hormones, I could divide the plant to four new little plants. My plan next is to change the ratio of the hormones in order to get callous and than separate between cells by shaking, changing back the ratio of hormones and hoping for little plants from each cell. When I have good result's, I will inform you.

If there is any plant that you are interested to propagate by tissue culture, I will be happy to try.

Randy Lamb (4304 East Pender Street, Burnaby, British Columbia, Canada V5C 2M6) writes:

I'm sure that many of us made contributions towards preserving or promoting nature on this past Earth-day 1990. The **Pacific Northwest CP Club** participated as well but with a slightly different twist to the story!

By chance alone, the Earth-day weekend was the first time this year that most of the club could get together for a field trip. Tom Kahl, Lorne Dennison, Bob Cattermole and myself [David Wong couldn't make this particular trip] trekked out to our club's CP bog near Vancouver BC to check the results of last years efforts. We had previously searched and planned for a couple of years to find this suitable location and finally last year Lorne and I started the CP bog off with several plantings of the western form of *Sarracenia purpurea* [see CPN 18(1): 7-8].

As we had hoped, we were greeted at our CP bog by a few of the *S. purpurea* putting up flower stalks. To add to these, additional pitcher plant seeds were sown, followed by the planting of many young *Dionaea, S. flava* and *purpurea* plants, *S. purpurea x flava* hybrids and finally a juvenile *Darlingtonia*.

Upon completing our taks we stood back to admire our work in silence realizing that we had made a successful contribution to Earth day after all! We had established a colony of hungry flesh eating plants next to this peaceful community where it turns out they had filmed part of the horror flick "Food of the Gods" several years ago; how appropriate it seemed.

Steve Ludlow (8 Rowland Close, Copthorne, W Sussex, RH10 3HT, England) An observation of an unusual mode of propagation in *Dionaea* - part 2

Since writing my original article (C p29, CPN p4) I have read Schnell's book on CP where he mentions this phenomenon (vegetative apomixis) and claims that it is caused by temperature fluctuations during early flower bud initiation (i.e., cold nights and warm days in spring) (S p21). He produced the effect by growing the plants on a window-sill in March so that they were warm in the sun by day but very cold at night. Other environmental shocks would probably produce the same phenomenon.

When I sent a copy of the original article to CPN, the editor sent me a reproduction of a paper published in 1892 (H) reporting vegetative apomixis in *Dionaea* so the phenomenon has been recognized for nearly a century.

It is said to occur in several CP genera and this type of relocation of part may well be important in CP evolution (JRJ p288).

Literature Cited
(C) Carnivorous Plant Society Journal, Vol. 13, Autumn 1989.
(S) Carnivorous Plants of the United States and Canada D.E. Schnell, Pub. J.F. Blair, Winston-Salem, North Carolina.
(H) J.W. Harshberger Botanical Laboratory of the University of Pennsylvania 1, 7-45 (1892).
(JRJ) The Carnivorous Plants, B.E. Juniper, R.J. Robins, D.M. Joel, Academic Press 1989.
(CPN) Carnivorous Plant Newsletter, Vol. 18, March 1989.

Joe Mazrimas (329 Helen Way, Livermore, CA 94550) has a request about book sources:

I noticed over the years that various book sources that we listed in the past have quit selling CP books without any obvious replacement. As a result, new subscribers to CPN are asking how to obtain "out-of-print" or books published from another country. If any of our subscribers can help out in locating good CP book sources, please let me know so we can list them. I consider a good book source anyplace other than the publishing house itself. If you look at a recent listing in the March issue, it is obvious which books we are talking about. The former CP source, WIP, is out of business and with it went many books they sold. I will collect names and book stores and CP people who wish to sell their books and publish this listing from time to time.

Bruce Pierson (P.O. Box 179, Albion Park, N.S.W. 2527, AUSTRALIA) writes:

Follow-up on *S. flava* (9 petals): In the March 1987 CPN, I made mention of one of my *S. flava* seedlings that had flowered for the first time in the 1986 flowering season, producing a flower with 9 petals. During the 1987 and 1988 flowering seasons, this plant did not flower, however, this year (1989), the plant produced 3 flowers. This year, however, the flowers produced only 7 petals, instead of the 9 previously produced. This year, 2 of the flowers were selfed, the other being pollinated with *S. flava* var. *rugellii* pollen, to see if this characteristic is carried onto offspring. For some reason, seedlings from a previous selfing of this plant have been exceptionally slow to grow, and are only 1" high after more than 2 years has elapsed from the time of planting the seed.

Flower variation in *P. primuliflora*: Some of my *P. primuliflora* plants have produced aberrant flowers this year. On the same plant, have occurred much smaller almost white flowers, along with the normal larger purple flowers. Several plants produced these aberrant flowers, and in each case, normal flowers were also produced at the same time.

A new *Drosera* species: Some years ago, a close friend of mine, Brian Whitehead, discovered what appears to be a new species of *Drosera*, which is as yet unnamed, and apparently undescribed. Both Brian and I have discovered extensive colonies of this new species in widespread locations in eastern N.S.W., and Brian has also found colonies in eastern Victoria.

This species resembles *D. peltata* and *D. auriculata* closely, however, it is a distinctly different species, although some botanists would group *D. peltata, D. auriculata* and *D. sp.* all in the one group as ssp. of a *D. peltata*.

D. sp. is an erect plant. Usually more robust than either *D. auriculata* or *D. peltata*. Its color is also very distinctive in that it is a golden green, a color which I have never seen in *D. auriculata* or *D. peltata*. This species is unusual in that it **always** produces

a basal rosette, at all stages of its growth. Both *D. peltata* and more so *D. auriculata* seldom produce a basal rosette once maturity has been reached. Another peculiarity of this species is that in very old plants, up to 10 stems may emanate from the one basal rosette, although this is not commonly seen, and when seen, usually not more than 5 stems are produced, with 3 being more common.

The sepals of this species are glabrous, with fringed margins, and the seed closely resembles that of *D. peltata*. It has been suggested that *D. sp.* may be a hybrid between *D. auriculata* and *D. peltata*, however, it is my opinion that it is not, because of the distinct dissimilarities pointed out earlier.

This species has been found in areas where *D. auriculata* and *D. peltata* do not occur, and its has also been found in areas where *D. auriculata* and *D. peltata* occur side by side. When found in these latter locations, each separate species will be found in a small group, and it is extremely uncommon to find any of the species growing with individuals of another species. As a field identification, until this plant is officially described, I have labelled this new species as *D.* sp. *'auricta'*, because of its similarity to *D. auriculata* and *D. peltata*.

Gene A. Santagada (16 North Avenue, Apt. E, Beacon, NY 12508) writes:

I have been a subscriber for a number of years and have found your articles, photos, and letters interesting and helpful. I am an apartment dweller and maintain a small collection of CP in two lighted aquariums. Lately, I have delighted how the Society has become concerned with preserving the plants' native habitat, and a switch from growing field collected plants to cultivated ones. I have been thinking of writing occasionally to share some of my limited knowledge with your readership, and hopefully have some questions answered. But something has come to my attention which deeply disturbs me and has compelled me to write.

I have recently become a member of the American Orchid Society (AOS) and read with great distress two letters in the February 1990 issue. Apparently the DEA (Drug Enforcement Administration) has compiled a large list of people who have done business with horticultural equipment supply companies, and the people on the list are now considered CULTIVATORS OF MARIJUANA!

Mr. J. Huberman writes that he purchased a light meter from a company advertising in The AOS Bulletin. A short time later three policemen from the State Bureau of Investigation showed up at his house saying they had evidence that he was growing marijuana because of the shipment of the light meter. Mr. Huberman stated that he found out that the DEA subpoenaed records from the United Parcel Service concerning of shipments from this supplier.

In addition, Mr. G. Kraske writes to complain of harassment of people and companies by the DEA that posses totally legal materials (i.e., lights, fertilizer, and potting mixes). He quotes from an article which appeared in the Seattle Times., October 27, 1989 stating that the DEA has compiled a list of *"thousands of individuals who are suspected of being involved in the indoor cultivation of marijuana"* and *"this is just the first phase"*.

Certainly the abuse of drugs (both legal and illicit), is a serious problem, in this country, and many other democracies. But is it proper that searches are done of peoples homes because they purchased gardening equipment which could possibly be misused? Are people or suppliers to be considered suspects because they own or sell such equipment? Will a time come when their will be a knock at the door and you will be dragged away screaming in the middle of the night because *Sarracenia rubra* ssp. *jonessii* is growing under mail order florescent lights?

Apparently some people in our government feel that the "War" on drugs should be declared on the American people. I feel this attitude is a pernicious corrosion of our constitutional rights. If any members of ICPS have been harassed, I suggest that you contact the editors of CPN and your Congress-person.

I have enclosed a copy of the letters sent to the AOS which are reprinted below — Ed.

Reprinted from American Orchid Society Bulletin 1990:59 (2): 164. Member's Forum. Opinions stated do not necessarily reflect that of the ICPS, but member are welcome to respond - send all letters to Joe Mazrimas.

Unreasonable Search — and Seizure! Editor:

I am a new AOS member, having begun this interesting hobby just this spring. In the process of setting up my growing are I purchased a light meter from an advertiser in the AOS Bulletin. On November 1 three policemen from the State Bureau of Investigation showed up at my house saying they had evidence that I was growing marijuana because of a shipment, the light meter, that I had received. I found out that the Drug Enforcement Administration (DEA) subpoenaed (from United Parcel Service) records of shipment from this advertiser.

I wonder how many orchid growers were searched and how many others are on a "suspect" list because they purchased materials that could be used to grow marijuana.

Drugs are undoubtedly a significant problem in this country, but 1) searching the homes of citizens because they purchased legal gardening equipment and 2) harassing the customers of legitimate businesses because their products can be misused erode our constitutional rights.

At this point companies selling horticultural supplies are being harassed. Members of AOS are finding themselves on DEA lists, subject to searches. Where will it end? I hope the AOS will protest these actions to the DEA and demand an explanation. Joseph Huberman, 904 Dorothea Drive, Raleigh, NC 27603.

Something terrible has happened, something that violates the principles of our society, country and traditions in a real and fundamental way. The coordinated raids made the morning of October 26 on plant stores, greenhouses and supply houses in 42 states have all the same characteristics of that **Kristallnacht** of 51 years ago, perhaps in miniature, but perhaps, as the DEA says, "this is just the first phase" (Seattle Times, October 27, 1989).

What have they done to deserve such harsh comparison? They have taken the merchandise of merchants operating entirely within the law. This merchandise is nothing in the least questionable; everyone and his grandmother has some of it: lights, fertilizer and potting mixes. The DEA has shut down stores and financially penalized the owners by taking their property and their opportunity even to do business, all for nothing more than conducting normal, ordinary, legal business. Some places were boarded up; in others the merchandise was simply taken; in a few cases, they say, arrests were made.

The DEA also confiscated documents and said that it had "acquired the names of thousands of individuals who are suspected of being involved in the indoor cultivation of marijuana" (ibid.). Does this mean that I am a suspect just because I have purchased some plant-growing supplies? Are we **all** on the list now? Are all the customers of all the shops in all the states hit? The DEA said that this was just the beginning. When will they come for me? George S. Krasle, 2725 NE 143rd Street, Seattle, WA 98125.

Previously unnamed Australian *Drosera* and their published names.

The following list is complied from Allen Lowrie's book, Vol. 2 and a formal description will be written by Dr. Neville Marchant at a future date. This list was sent in by Gordon Snelling.

D. barbigera Planchon = syn *D. drummondi*
D. callistos = *D. sp.* 'The Lakes' (State Forest, Brookton Hwy.)
D. closterostigma = *D. sp.* 'Cataby'
D. coolamon = *D. sp.* 'Kalbarri'
D. echinoblasta = *D. sp.* 'camallo'
D. eneabba = *D. sp.* 'eneabba'
D. enodes = *D. sp.* 'Omissa-Marchant'
D. ericksonae = *D. sp.* 'Erickson's-omissa'
D. helodes = *D. sp.* 'bullsbrook'
D. hyperostigma = *D. sp.* 'platy-O'brien'
D. leioblasta = *D. sp.* 'Steve's-placea'
D. manniana = *D. sp.* 'Bannister'
D. nitidula ssp. *omissa* x *D. occidentalis* ssp. *occidentalis* = *D. sp.* 'Lake Badgerup"
D. occidentalis ssp. *australis* = *D. sp.* 'South coast'
D. omissa = *D. nitidula* ssp. *omissa*
D. oreopodion = *D. sp.* 'Armadale'
D. rechingeri = *D. sp.* 'Regan's Ford'
D. roseanal = *D. sp.* "Steve's-dichro'
D. spilos = *D. sp.* 'muchea'
D. walyunga = *D. sp.* 'Walyunga' (National Park)

Corrected June 12, 1990.

Evolutionary Patterns in *Drosera*

By JohnDegreef (6 rue Libotte, B-4020, Liège, BELGIUM)

Quite astonishingly, the *Drosera* of section *Thelcalyx* still have the same primitive, strictly penamere flower as *Aldrovanda*. There are two representatives: *D. sessilifolia* St. Hil. (South America) and *D. burmanni* Vahl (Australia, S.E. Asia, and India). The latter species has not clear-cut annual cycle and no specific mechanisms to survive droughts. When its substrate, usually well drained sand, shows the slightest signs of drying, the plant flowers. Then it just dies as soon as the seeds are ripe and only the latter survive the dry season (ASHLEY, 1975). This modulation of growth and flowering by droughts is typical of many tropical plants (RICHARDS, 1973, p. 66). Being a tropical plant, *D. burmanni* is not very likely to have reached Australia with the Antarcitc migration. As a primitive species contrasting strongly with the sophisticated Australian sundews, it must have arrived quite recently (via Africa and Asia?). Its chromosome number (2n = 20) (VENKATASUBBAN, 1950) still is the same as in many South Amercian species.

The second simplest flower structure has three (instead of five) unbranched styles. This we find in *D. meristocaulis* from Cerro de la Neblina in Venezuela, the only (surviving) member of its homonymous section. This is an odd-looking plant. Its ascending long oblanceolate leaves on a ramified stem and the auxillary flowers remind one of *Drosopyllum* (MAGUIRE & WURDACK, 1957).

Another group with 3 simple styles is section *Psychophila*, with *D. uniflora* Willd. in the cold Southern parts of South Amercia and, amazingly, two members in New Zealand: *D. stenopetala* Hook. and *D. arcturi* Hook. The latter is also found in the mountains of Tasmania and S.E. Australia. Depauperate forms of *D. stenopetala* resemble *D. uniflora* very much (DIELS, p. 65). These species must not have changed much since the Antarctic migration. The chromosome number of *D. arcturi* (2n = 20) links this section with South America (KONDO & WHITEHEAD, 1971).

The African equivalent of these species is *D. regia* Stephens, which was originally included in section *Psychophila*. A. A. OBERMEYER (1970) would rather place it in a section of its own. Yet the behavior of *D. regia* resembles that in section *Psychophila*. In *D. arcturi* a small area of the stem near the leaf bases swells up in Autumn, a possible equivalent of the *D. regia* rhizome. Smallish leaves are produced until the plant is covered with snow (MULLER, 1974; COTTER, 1986). *D. stenopetala* also forms small leaves in early Fall (BIRMINGHAM & COTTER, 1983). Significantly, so does *D. regia* (ZIEMER, 1980; SMYTHE, 1986). This species' biotope is cool and humid, one single mountain locality at an altitude of 1000 m. which is now the last refuge of this species since Africa drifted toward the equator.

These primitive remnants of the temperate climate *Drosera* announce changes in floral structure observed elsewhere. The styles are long and straight in *D. regia*, still undivided in *D. stenopetala*, but in some flowers of *D. arcturi* they show a tendency towards the basal bifurcation which is constant in *D. uniflora*.

The same 3 basally bifurcated styles (with two undivided branches each) are typical of the section *Drosera*. The branches tend toward a distal thickening and cleaving. Only in *D. natalensis* Diels does one find a new bifurcation about half way up the branches, a feature announcing things to come.

Most South American and African *Drosera* belong to this section. The leaf morphology often reminds one of the forms in the more primitive sections, i.e., spatulate-cuneate leaves with short, ill-defined petioles (*D. brevifolia* Pursh., *D. cavennensis* Sagot, *D. panamensis* Correa & Taylor, *D. chiapasensis* Matuda, *D. montana* St. Hil., *D. pusilla* Hbk.). An evolution towards narrow leaves is frequent (*D. arenicola* Steyermark, *D. chrysolepis* Taubert, *D. colombiana* Fernandez, *D. communis* St. Hil.). *D. cendeensis* Tamaya & Croizat looks like the North American *D. linearis* Goldie, and announces the theadlike leaf of *D. graminifolia* St. Hil. Rounder leaf blades also appear (*D. capillaris* Poir., *D. esmeraldae* Maguire & Wurdack, *D. felix* Steyermark & Smith, *D. kaieteurensis* Brummer-Dinger). The beautiful species *D. villosa* St. Hil. has the approximate shape of the well known *D. capensis* L., and the other African rosetted species resemble their South American relatives.

The many caulescent species are an important African innovation (the American *D. intermedia* Hayne is not very spectacular). There are short stems such as in *D. capensis* (broad leaf), *D. hilaris* Cham. & Schlecht., *D. bequaertii* Taton, *D. humbertii* Exell & Laundon, longer ones (to 25 cm) in *D. katangensis* Taton, *D. affinis* Welw., *D. glabripes* (Harv.) Stein, *D. madagascariensis* DC. The most spectacular species is *D. elongata* Exell & Laundon, which reaches a height of 60-90 cm, climbing on grasses and shrubs like its Australian counterparts of section *Ergaleium*. With its very small elliptic leaves this is a unique plant indeed.

Thanks to the persistence of primitive forces and to the large number of species available, the section *Drosera* offers good material for gaining some insight into the evolutionary mechanisms. The basic chromosome number is 2n = 20, as in *D. brevifolia, D. capillaris, D. intermedia*, all the North American species (KONDO, 1970) and probably many more.

Of frequent occurrence in plants is so-called polyploidy, i.e., a multiplication of complete chromosome sets. The supplementary genes are then free to mutate into useless intermediary stages which in the course of time may acquire new and interesting properties (OHNO, 1980). *D. capensis* (BEHRE, 1929) and *D. madagascariensis* (KRESS, 1970) are tetraploids: 2n = 40 chromosomes. The linear form of the leaves of *D. capensis* may be related to this, for a possible tetraploid form of *D. linearis* is said to resemble the Cape Sundew (SCHNELL & SIVERTSEN, 1974). *D. aliciae* Hamet is an octoploid (80 chromosomes) (KRESS, 1970).

An astonishing fact is that the more chromosomes a polyploid has, the smaller these are, and the less D.N.A. each edition of the genome contains: 25% of the original quantity in tetra- and octoploids, 50% in triploids (ROTHFELS & HEIMBURGER, 1968). The sequences lost are probably more or less useless repeats (46-95% of plant D.N.A.!). The loss of these redundant genes does not seem to harm the plant (JONES, 1978). The same observed in *Drosophyllum*, with 2n = 12 very large chromosomes (BEHRE, 1929). The amount of D.N.A. per nucleus is 16 times greater than in the diploid species of section *Drosera* (ROTHFELS & HEIMBURGER, 1968): this is much more than is needed to code for proteins! The many repeats may have a regulatory function, for as in polyploids the cells and nuclei here are much larger than in other *Droseraceae* (BEHRE, p. 298).

D. anglica Huds. has 40 chromosomes, but as seen the field, this may be a hybrid between *D. linearis* and *D. rotundifolia* L. (both 2n = 20). The resulting cross (2n = 20) is sterile but becomes fertile if the chromosome number is doubled through an embryological accident: **amphiploidy** (WOOD, 1955). Other possible examples of such a process are *D. collinsiae* (= *D. burkeana* x *D. madagascariensis* ?) and *D. dielsiana* (*D. burkeana* x *D. pilosa* ?) (EXELL & LAUNDON, 1956). *D. natalensis* Deils may be a hybrid also: its chromosomes are described was having an irregular behavior during (meiotic) cell division (OBERMEYER, 1970 quoting A. KRESS).

Another modification of the karyotype is chromosome fusion forming pseudoisochromosomes. These may be transmitted during meiosis in tetraploids (JONES, pp. 148-149). Possible examples of this are *D. cuneifolia* L. with 2n = 32 chromosomes (KONDO, 1976) and *D. regia* (2n = 34 chromosomes) (BEHRE, 1929).

The most advanced African *Drosera* are the species of section *Ptycnostigma: D. cistiflora* L., *D. alba* Phillips, and *D. pauciflora* Banks EX DC. Their 3 styles are bifurcated at their base as in the preceding section, but the branches are themselves ramified. The chromosome number of *D. cistiflora* is 2n = 60 (BEHRE, 1929) and this plant may be a hexaploid with a basic number identical to that in section *Drosera*. Together with the similar flower structure, this probably shows section *Ptycnostigma* to be a specialized branch of the latter. This is also borne out by the co-occurrence of the naphtoquinones plumbagin and 7-methyljuglone in *D. cistiflora* and *D. capensis*. The other African *Drosera* tested only contain the second compound (ZENK et al., 1969). The most prominent characteristic of section *Ptycnostigma* is the yearly production of a fleshy root into which the plant retreats during the dry season (DIELS, p. 34); DEBBERT, 1987).

Such adaptations to an arid climate are even more sophisticated in Australia where many species have mutated beyond recognition. This holds for their vegetative parts but also for their flowers and karyotypes.

The clearest example of flower evolution is found in section *Lamprolepis* with the majority of pygmy *Drosera D. platystigma* Lehmann var. 'sewelliae' still exhibits 5 styles. In some species an inconstant reduction to 4 styles (*D. occidentalis* Morrison, *D. parvula* Planchon, *D. pulchella* Lehmann) or even 3 (*D. dichrosepala* Turcz.) is observed. *D. leucoblasta* Benth. has 3 to 4, the other species 3 simple styles (*D. barbigera* Planchon, *D. nitidula* Planchon, *D. omissa* Diels, *D. paleacea* DC, *D. platystigma* Lehmann, *D. pycnoblasta* Diels, *D. scorpioides* Planch.). The strange *D. pygmaea* DC has a truly tetramere flower and is therefore considered the sole species of section *Rorella*. The chromosome numbers are not primitive at all: 2n = 10 for *D. paleacea* (KONDO & LAVARACK, 1984), 18 for *D. pulchella* and 28 for *D. pygmaea* (KONDO et al., 1976). These must be examples of advanced chromosome fusion in polyploids.

The adaptations of these two sections to aridity are remarkable too. The dwarfed rosettes hug the ground, where the dessicating wind is slowed down by friction. The prominent stipules serve the same function. The 'gemmae' are an even more sophisticated mechanism to survive the dry season, based on the production of tough buds which eventually become detached and regenerate a new plant each.

In section *Arachnopus, D. schizandra* Diels has very broad leaves, distally bifurcated styles and weird stamens. In the taxonomically somewhat uncertain *D. indica* L. the opposite is observed: the leaves are very narrow, the styles branch basally and the stamens look more like their equivalents in section *Drosera* too. *D. adelae* F. Muell. is intermediate in all respects and may therefore be an amphiploid between the two. Its red-flowered form (STUDNICKA, 1988) may be the corresponding hybrid. The fourth species is *D. prolifera* C.T. White with its well known shape. The styles bifurcations here are somewhat more basal than in *D. schizandra*.

North Australia harbours a group related to section *Drosera*: section *Lasiocephala*. The species are: the polymorphous *D. petiolaris* R. BR., the recently described *D. dilatatopetiolaris, D. falconeri, D. lanata* (KONDO, 1984) and, astonishingly, *D. neocaledonica* Hamet. The latter must have reached New Caledonia during the Eocene or Miocene, when the Coral Sea wa still rather narow (TERMIER & TERMIER, p. 89). *D. falconeri* resembles *Dionaea* and is sometimes considered as a kind of 'missing link' (MAZRIMAS, 1987). This does not seem likely if the *Dionaea* trap evolved under water. The flower structure of these species resembles that in section *Drosera*: basally bifurcated styles (but the branches themselves are again divided).

Section *Lasiocephala's* defence mechanisms against droughts need not be as sophisticated as in Southern plants: the dry season here is the winter! The plants are often hairy, which again is a way to slow down the dessicating air flow by increasing friction. During the summer *D. petiolaris* forms a compact resting bud (LAVARACK, 1977).

Leaving aside for the moment one or the other odd sections, we finally reach the most advanced *Drosera* in the world: the subgenus *Ergaleium*, which has had time to differentiate into three sections: *Ergaleium, Erythrorrhiza* and *Stolonifera*. The most astonishing mechanism to resist summer droughts has been developed here. Soon after the plants come out in Autumn, they produce an auxillary branch of the stem. This (often subterranean) branch grows downwards, then its apex turns upwards and starts accumulating water and food reserves. At the end of the rainy season all parts of the plant die with the exception of the swollen underground stem apex which is called a 'tuber'. The next year, the apical growth point of the tuber resumes its activity. It produces a new stem, which gives off a branch, and the process starts all over again. Some species rely on the production of more than one replacement tuber rather than on seeds for propagation (*D. zonaria* Planch., *D. whittakeri* Planch., *D. erythrorrhiza* Lindl. and to a certain extent *D. stricticaulis* (DIELS) O. H. SARGENT).

There is no need here to describe in detail the vegetative parts of all the species concerned. Section *Ergaleium* contains erect species, often climbers with wiry stems, or ramified ones. In section *Erythrorrhiza* all species have basal rosettes with unusually broad leaves. The fan-leaved sundews possess a basal rosette and stems with clasping leaves. The polymorphism of many of the species in all three sections is a sign that the evolution of these plants is still going on (DIELS, p. 45). As to the flowers, the styles here are often extremely ramified and bushy.

Few chromosome numbers have been determined: in section *Ergaleium* *D. auriculata* Backh. and *D. peltata* Smith have 32 (KRESS, 1970), *D. gigantea* Lindl. 28 (KONDO, 1976) and *D. menziesii* R. BR. 26 (KONDO, 1973). *D. whittakeri* Planch. from section *Erythrorrhiza* has 2n = 28 chromosomes (KRESS, 1972). These all seem to be polyploids with subsequent chromosome fusion.

The odd species *D. hamiltonii* C. Andrews also has 28 chromosomes (KONDO, 1976) and is sometimes described as being close to section *Erythrorrhiza*, but without a tuber (CLEMESHA, 1974; SLACK, 1979). This relation is not at all confirmed by the floral structure: this species has three rather unique fused styles similar to *Dionaea's* and justifying its classification in a separate section *Stelogyne*. No modern Australian species possesses a flower structure which could have produced *D. hamiltonii's* (DIELS, p. 48), except maybe the pygmies with 3 simple styles(?).

D. glanduligera Lehmann, the only member of section *Coelophylla*, has curious concave leaves which look like tiny scoops. This shape is very rare and reminds one of many *Drosera* of section *Ergaleium*.

There are other parallels with these. Certain species of section *Ergaleium* flower at the end of the season just before dormancy (ROSE, 1977). This may be a primitive trait already mentioned in tropical *Drosera*. *D. glanduligera* also flowers and dies when its surroundings become dry (CLEMESHA, 1974), but if this does not happen, the plant is said to live through the summer, having then formed a very small, whitish tuber (NASH, 1973)! The flower has dichotomously ramified styles like many species in the subgenus *Ergaleium*. The seeds take up to two years to germinate as in the latter (NASH, 1973). This could be an adaptation to bushfires (LAMPARD, 1987). All in all this species may well be an example of what the ancestors of the tuberous sundews looked like.

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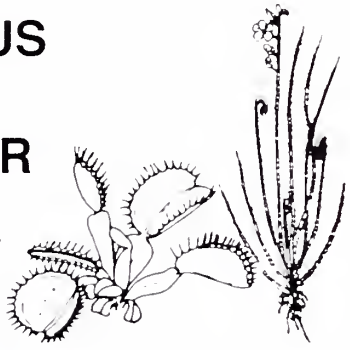

ICPS was founded in 1982 in Fullerton, California but its Newsletter (CPN) was co-founded by Joe Mazrimas of Livermore and Don Schnell of Virginia in 1972. Although the Newsletter began its format as a typed 8-1/2 x 11 inch manuscript with a B&W photo on its cover, it was beautifully changed into a 28 page magazine with many color photos in 1978. Leo Song of California State University at Fullerton was added to our staff to coordinate the printing and distribution.

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The Granchina *Nepenthes* of the Phillipines in Retrospect

By Bonifacio D. Uy (No address submitted)

The camera felt odd in my hand as I lifted it from the box where I'd stored it 30 years ago. Opening the cover my confidence sank low when the flap tore loose at the slightest tug. Having had to pry the camera open to put in a roll of film was too much, so I decided to take a break and contemplate on the task ahead.

Going to the south of Cebu to search for *Nepenthes* would be less arduous but also less exciting than Surigao. But I wanted to see one and should a mistake be made in data gathering, rectifying it would be much easier than if a trip to Surigao was to be made. Heartened I proceeded with the task at hand.

At 4:30 in the morning of April 4, off I went to meet a friend who was to take me to the highlands of Dalaguete. We got to Dalaguete by bus and transferred to a jeep that took us to Mantalongon a famous market deep in the hills. We were packed into the jeep like cattle. Altogether the trip would have been pure hell were it not for the picturesque view from the window of the jeep as we slowly passed that point where the road is narrowest and the ravine deepest.

The higher the jeepney went, the cooler it became as the jeep labored the 15 km to Mantalongon. The cool air of the high altitude was a welcome respite to the searing heat of the drought that hit this part of the country. Also, the clean air made one wonder what makes the city with its smog and diminishing quality of life so alluring to people who flock to it in ever increasing numbers every day.

We got to Mantalongon at lunchtime and immediately set out to search for *Nepenthes*. As we climbed the sun-scorched hillside the thought of another fruitless search ran through my mind time and again. Wild goose chases are simply not my cup of tea.

B. D. Uy in a patch of Granchina *Nepenthes (N. alata)*
Photo by Author.

After a few hours of clambering up and down hills we came upon a little house. Though visibly worried by our presence the occupant of the house greeted us cordially. There has been a resurgence of guerrilla activity in these parts making the locals wary of strangers.

Asked about *Nepenthes* the guy pointed to a clump of bushes twenty meters from the house. Quickly I headed for the spot where saud-saud-the local name for *Nepenthes* is supposed to be and lo and behold there it was. *N. alata* had been sitting there all these times waiting for the world to discover it.

We hurriedly made some preliminary tests, because night was fast closing in and took home samples. More tests will be done next time.

Being a newcomer to the world of *Nepenthes* I wondered what makes this plant thrive in this part of the world. One thing is certain though, very soon *Nepenthes* will become extinct because the area is a farming community and the plant is lumped together with weed to be slashed and burned.

A Real Nice Trip to Southeast Asia

Article and photos by:
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Bruce Salmon (6 Ross Martin Pl., Takanini, Auckland, NEW ZEALAND)

Ever since I (Ric Maulder) was knee high to a grasshopper, I have always wanted to go to the topics. Well, I finally got my chance to go and went to Sumatra to look for *Nepenthes*. It seemed, at first, that I was going on my own so I planned to spend all seven weeks in Sumatra. I wanted to climb new mountain areas to look for new species. As I was working away on my itinerary, three other people decided to come along. The plans changed so that we decided to spend one month in Sumatra and the rest of the time in Sarawak and West Malaysia and look mainly in known locations.

With this in mind, we decided to use Singapore as our jump-off point into Sumatra stopping off at Medan first. Once there, we hired a van with a driver named Iwan and went south through Sumatra in 4 days to a village called Gisting near Tanjungkarang in Lampung district at the extreme southern end of the island. All the way down the trans-Sumatran highway we saw *Nepenthes* which were *N. tobaica, N. reinwardtiana* (very common in the general area), *N. gracilis, N. ampullaria* and *N. mirabilis*. We harvested seed of *N. gracilis* in the Jambi district. The weather in south Sumatra was rather dry and *N. mirabilis* was growing on real dry roadside banks.

From Gisting we climbed Gunung Tanggamus where we met our first leeches and had to camp near the horrors that night. It was funny to watch them moving over the tents during the night. In the morning we set off curring our way through solid ratans all the way up to 2,000 meters before they gave way to a pure moss forest. At this elevation, we found *N. gymnamphora* and two of us decided to return, but Mike and I wanted to find *N. spathulata*. Further up, it was virtually impossible to get around and we seemed to be 5 to 10 feet off the ground walking over moss-covered tree trunks. We never saw it like this on any other mountain in S.E. Asia. We managed to find some *N. spathulata* and they are a fine, large, glossy-green plant with large pitchers. We never reached the summit as we had also run out of time. So with a few cuttings and seedlings, we ran down the mountain barely reaching the other two explorers before

they reached the camp. As it was getting dark, we drank heaps of water once we returned to the van. Up the mountain we resorted to squeezing the moss to quench our thirst.

We headed back up the line and went to G. Dempo as we wanted to climb at least one unknown mountain. On this mountain, we found a new species related to the highland Sumatran species by its leaf shape, stem shape and inflorescence, but its upper pitchers are slightly similar to *N. alata* from the Philippines. We gave the name *N. 'dempoensis'* after the mountain from which it originated. The name is still nomen nudem.

Next, we headed to Bangko and over the range to Tapan. On the way over at the elevation of 1,250 meters we found *N. ampullaria* with large pitchers and below in Tapan and Inorapura areas, we found a number of lowland species and hybrids. We found *N. x hookeriana* here but no *N. rafflesiana*, however, we never looked in the forested areas. On the coast up to Padang, we saw more lowland *Nepenthes* and harvested seed of *N. mirabilis*.

Climbing G. Talang, we found *N. gymnamphora, N. pectinata, N. bongso, N. inermis* and also a strange-leaved *Nepenthes* with ovate lower pitchers and very wide non-petiolate leaves but slightly different from other Sumatran *Nepenthes*. However, the upper pitchers resembled large *N. bongso* or *N. macfarlanei* pitchers and it is probably allied to these species. We saved a few plants but also took cuttings and collected abundant seed of *N. bongso*. *Nepenthes inermis* is epiphytic and most of them were seen high up in the branches of trees. The plant has very small lower pitchers with a peristome like *N. lowii* and unusual upper pitcher development. These pitchers start out as a flat bud and then "pop" open into round pitchers with a very thin lid (as seen in the photo). We noticed that the fluid in the pitchers was very sticky and viscous because while I was in the tree, I tipped a pitcher and the fluid streamed out in a thin line to the ground over a distance of 15-20 feet. An interesting hybrid of *N. bongso x N. inermis* was found that is like *N. dubia* from G. talamau but still different. Although *N. bongso* and *N. gymnamphora* are terrestrial, *N. pectinata* was epiphytic. We also located a plant that had upper and lower pitchers like *N. bongso* but much larger and epiphytic. The leaves had a slightly different shape and feel to them and it may be a *N. bongso* hybrid.

It was good to use the rhino tracks to get up and down the mountain as they made walking a bit easier.

After returning to Padang, John flew back to New Zealand with the cuttings to look after them. So we waved goodbye to him as the DC-9 left Padang and we observed the *Utricularia exoleta* growing in the ditches by the side of the runway.

We went to Lake Maninjau and on the road to the lake spotted *N. reinwardtiana* and on the cliff tops some plants that looked like *N. tobaica* but with one long inflorescence. I supposed these were the *N. alata* from the Bukittingi area. We also saw them near Payakumbuh on similar cliff tops. These are definitely not the same plant species from the Sibolga area and I wish someone would study these so-called Sumatran *N. alata* variants. Anyway, I climbed the cliff in my bare feet which I often did on roadside jaunts and obtained some male and female cuttings as there was no ripe seed at the time.

We could not climb G. Merapi because it was active. We felt this was slight but the authorities wouldn't permit us to go up and advised against it. We wasted some time on trying to climb G. Sago as Bruce stayed at the hotel since he was sick. Mike and I walked for miles up a road which turned out to be the wrong track and led us to a 1,400 meter plateau in the middle of nowhere. The next day we tried another track walking all morning through rice paddies but eventually gave up G. Sago on this trip as we were behind on our itinerary.

New *Nepenthes* species from G. Pangulubao Sumatra

N. rhombicaulis

N. spectabilis

N. northiana lower pitcher

N. gracillima (left)
N. gracillima x N. macfarlanei (middle)
N. macfarlanei (right)

N. spectabilis (left)
N. bongso x N. inermis (middle)
N. inermis (right)
From G. Talang

N. macfarlanei

N. treubiana

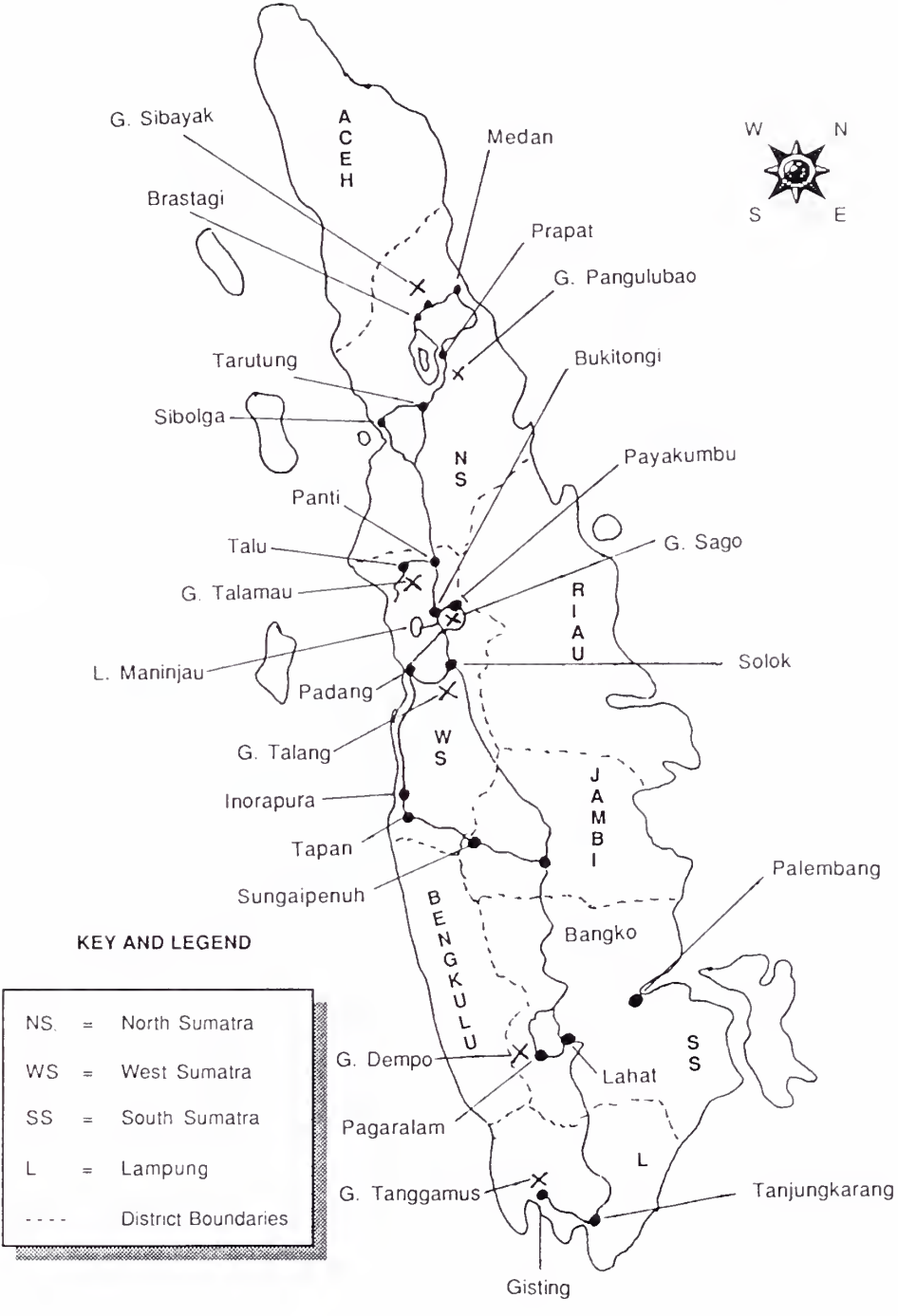
N. sp. 'New Species'
From G. Pangulubao

N. bongso
From G. Talang

N. spathulata

N. alata

SUMATRA


G. Sibayak
ACEH
Medan
Brastagi
Prapat
G. Pangulubao
Tarutung
Bukitongi
Sibolga
NS
Payakumbu
Panti
Talu
G. Sago
G. Talamau
RIAU
L. Maninjau
Solok
Padang
WS
G. Talang
JAMBI
Inorapura
Tapan
Palembang
Sungaipenuh
BENGKULU
Bangko
G. Dempo
Lahat
SS
Pagaralam
L
G. Tanggamus
Tanjungkarang
Gisting
W
N
S
E
KEY AND LEGEND
NS = North Sumatra
WS = West Sumatra
SS = South Sumatra
L = Lampung
---- District Boundaries

We made our way up to G. Talamau and saw the usual *N. reinwardtiana* all along the way, but also saw yellow-flowered terrestrial *Utrics* which may be *U. subulata*. We thought it would take two days to climb it but after two days we made it only to 1,500 meters and due to lack of provisions, we had to turn back. Next time we plan to allow more time and more provisions.

We bypassed G. Lubukraya and went to Sibolga. South of Sibolga we found some lowland *Nepenthes* and hybrids with plenty of seed pods full of seed. The best of all the *N. gracilis* in S.E. Asia was the black type where we collected bits and pieces to take back. Also, we saw *N. truebiana* and *N. alata* and collected cuttings of these from areas that the farmers were burning off for cultivation. My impression is that *N. truebiana* of Sumatra is fairly closely related to *N. rafflesiana*. If you look at the leaf and stem, it has a very similar look and feel and the general plant habit is similar also. The lower pitchers are different though but we feel it is still rather closely related to *N. rafflesiana*. Some of the upper and intermediate pitchers were quite large and it competes with *N. spathulata* over which species has the largest pitchers in Sumatra.

We carried up toward Tarutung and still on the Sibolga road we found *N. tobaica* at 1,000 meters. These plants were growing to the southwest of Lake Toba which indicates that the *N. tobaica's* range is wider than previously indicated. At Tarutung, *N. reinwardtiana* and *N. ampullaria* were seen on the way south. We harvested seed of both and a few red *N. reinwardtiana*.

The next 3 days were spent going in and out the bush around G. Panguluba. From 1,800 to 1,900 meters near G. Panguluba and G. sibok Manok, we found populations of *Nepenthes* with two different rosette pitchers. Neither plant had upper pitchers but one type had rhomboid-shaped stems on the climbing vine and may be *N. rhombicaulis* according to the plant in Knodo's book. One question we had was the variability of the pitchers and wondered if the red ones with wide peristomes, as shown in the photos, may be the same species.

On the higher steep slopes of G. Pangulubas, we saw several species of *Nepenthes* and also a small blue-flowered *Utricularia* growing in the sphagnum moss. One species of *Nepenthes* was growing prostrate 5-6 feet with no upper pitchers but the lower pitchers resembling *N. gymnamphora*.

The plant and inflorescences were minature in size and the pitchers had teeth up to several milimeters. Another species we saw had lower pitchers very similar to the plant labeled *N. pectinata* in Kondo's book. The upper pitchers were very similar in size and shape to *N. bongso* from G. Talang. The whole plant is prostrate like *N. bongso* and the inflorescences are very short like *N. bongso* and one-flowered. Also observed, the lid has a very prominent glandular crest and from what I am aware, no Sumatran *Nepenthes* have a crest, only some have a glandular boss such as *N. caranculata* and *N. rhombicaulis*. However, these plants have a good crest like *N. pilosa* and *N. maxima* ect. They were mainly epiphytic but some were growing on the bases of trees or on logs. All others in the area were terrestrial but some *N. spectabilis* were somewhat epiphytic also.

We saw another *Nepenthes* that is different than the others we saw in the higher highland areas. It has small pitchers slightly similar to *N. tentaculata, N. tobaica* and *N. gracilis* but tougher and thicker. The pitchers are always nicely colored with blackish lines and markings similar to *N. fusca*. There was very little variation with this species as all mature plants had ample rosettes on the ground and also at intervals up the stem. The stems were slimbing up to about 7 meters and had upper pitchers similar in color and shape to the lower pitchers but with the usual differences. The male inflorescences were about 20 centimeters, peduncle inclusive.

The other species we saw was *N. spectabilis* and these seemed a little different than the plant in Kondo's book. The New Zealand grown *N. spectabilis* has very hirsute leaves, stems and pitchers, and leaves and pitchers were a darker green in color. We collected seed of all *Nepenthes* on this mountain except the small *Nepenthes* with blackish pitchers. Hybrids between most or all the species looked quite nice ineed.

At this time, we went to Medan and Mide flew out to Singapore for a few days before going home while Bruce and I shot up to Brastagi for 3 days to laze around while waiting to fly across to Kuala Lumpur. While in this area we noted the detail and color range of *N. tobaica* pitchers which were a pure green to black and general reds in between. They seemed to like the local scrub and especially tea trees and so it felt like we were back in New Zealand. It was like this in many areas of Sumatra and the scenery is very similar in natural areas with similar species of plants. We also saw some *N. tobaica*-like plants at 1,900 meters or more on G. Dibayak near the crater and on one plant a pitcher had spots similar to pitchers of *N. reinwardtiana* but the pitchers were too large to be *N. tabaica* and perhaps is a hybrid of the two species mentioned. Near the area is Lau dubuk dubuk where Danser recorded *N. reinwardtiana*. We feel that *N. tobaica* is not as closely related to *N. reinwardtiana* as some think it is; but, of course, its still in the same group. In some other areas as Jambi, we found hybrids of *N. reinwardtiana x N. gracilis* and these can look similar to the parents.

After what we saw in Sumatra, we feel a need to return annually and check out new areas for *Nepenthes* and also clean up the classification of Sumatran *Nepenthes*. We would do this by first going to Bogar to review the original sheets in the herbarium to study what is there. Since our return, for example, we have read notes on plants from G. gadut near Padang. Plants that were named as *N. bongso* are identical to *N. inermis* and a plant labeled *N. alata* is *N. mirabilis*. It is all very confusing. Its time that a good book was written on *Nepenthes* and hopefully in time all of us interested in this *Nepenthes* project can come up with good color photos and descriptions of all species and forms possible. I have been thinking about this for some time now and I know others would be willing to contribute.

Bruce and I flew Kuala Lumpur and picked up a car for 3 days. We drove up to the Cameron Highlands northeast of K. L. and passed some lowland *Nepenthes* on the way up to 2,000 meters. Sleeping overnight in the car nearly killed us due to the low night temperature. In the morning, we looked in the general area and found plenty of *N. macfarlanei* and some *N. sanguinea*. We obtained plenty of seed and small plants especially where the mower cuts them up after they reach a few inches high. Further down, at 1,800 meters, there was abundant *N. sanguinea* and *N. macfarlanei x N. sanguinea* hybrids. Both species are highly variable and larger than those found in the Genting area. Some *N. sanguinea* pitchers were over 12 inches long and one particular one was 16 inches to the top of the lid which was at a 45 degree angle. The color of both species were attractive as well.

From here we headed back down to about 1,100 meters in the Ringlet area and found *N. albomarginata*. We managed to get seed of this species and found our only snake on the trip (apart from a couple on the roads and dead ones). It turned out to be a very docile green pit viper that was coiled up in the fern and *Nepenthes* stems. I pushed at it without seeing it at first while attempting to climb for more seed and saw it as the stems were released. There was no time to worry but I yelled to Bruce to bring the camera and took pictures of the beautiful creature. I gave it a miss on picking the snake up and decided to leave the seed too, of course!

On the way to Fraser's Hill, we found *N. sanguinea* and saw a local with an armful of plants of which he was going to use the leaves for healing skin lesions in the usual way. I was surprised they are still being used this way.

After leaving here, we went up to Genting Highlands traveling on the super-wide road up to the city of resorts. We couldn't believe the development (rather destruction) of buildings and roadways here. In the building site areas, we collected ample *N. gracillima, N. macfarlanei*, hybrids of the two and some *N. sanguinea*. More seed of *N. macfarlanei* was available here. During the day it was 13 degrees C (55 F). Now I know why my highland *Nepenthes* like our winter and surrounding months best as it suits their growing temperatures well.

During these 3 days, I was running around with bare feet and shorts and I never got a single leech on me, but somehow Bruce did while cleaning up at the stream. So he put toothpaste on the little vampire and it quickly let go! It worked as good as the repellent did in Sumatra!

We returned the car and went to Singapore for a couple of days and then flew to Kuching from Johore Boru. We spent 2 weeks in Sarawak and saw the general lowlanders as well as rather nice *N. northiana* and nicely-striped *N. albomarginata* in the Bau area. On G. Serapi we found *N. albomarginata* growing epiphytically up in the trees and not on the ground except in a couple of instances. Also found was *N. tentaculata* and *N. hirsuta* of which the *N. hirsuta* was mottled in a rust color. These three species were growing at 800 meters on the crests and ridges. In the open areas, there were also *N. rafflesiana, N. ampullaria, N. gracilis* and one *N. reinwardtiana* on the hill but surprisingly no hybrids!

Down in the lowland areas we observed small, black bees visiting the male flowers of *N. mirabilis*. Over the entire trip we took time to smell the flowers and noticed that the lowland species tend to be scented and especially so in the morning. *N. ampullaria* had a nice scent but *N. mirabilis* had a smell I would not like to describe!

While in the Kuching area we saw more *U. subulata* which had larger flowers than plants in any of the Sumatran locations. Also growing in this area was a smaller blue-flowered species and perhaps it was *U. minutissima*. Also at 800 meters on G. Serapi we saw our only *Drosera* on the trip and they were *D. burmanni* growing on an old cleared site.

We all thoroughly enjoyed the trip to see our favorite plants in the wild along with meeting really nice people in Sumatra and Sarawak. The locals were always helpful and friendly and all the tourists we met were really pleasant, too. It really made our trip worthwhile and something to remember. Bruce and I also did some sightseeing in Sarawak and on returning to Singapore, we missed our plane back to New Zealand. We were able to fly back the next day via Christchurch to Auckland. We got through customs and agriculture alright and all the *Nepenthes* are fine in quarantine. Also, the seed germinated well except some seed of *N. alata x truebiana* which was not ripe enough but we gave it a go anyway.

I would like to thank Robert Kresanek, Greg Gamble, Claus Thiede, Lee Braithwaite and Phil Cotter for supplying me with monograph material and maps. Thanks also to my wife Hazel and parents who funded my trip. Claus also supplied me with maps which were of excellent use.

All the plants are rooting well except the *N. northiana* cuttings. Nice pitchers are forming and in time I may send a few photos for CPN. It may be of interest that I found *Nepenthes* seed can take up to six months to germinate while some of mine took four months from the seed I collected. I had *Nepenthes* seed take 8 months to germinate after sowing, so do not throw seed away too soon as I found out the hard way!

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Sumatra Tip Additional Notes

By Ric Maulder, 145 Lon Kauri Rd., Kare Kare Piha, AK 1450, NEW ZEALAND

Here are a few additional details of my Sumatran trip which I like to share with you. I have heard that M. Hotta and another author published a monograph in 1986 on *Nepenthes* from North and West Sumatra and if anyone knows where I can locate a copy, I would be most grateful. It may contain a discussion on the *Nepenthes* from Gunung Pangulubao area and their views on the *N. alata* variants.

Although I have plants and seedlings of many species, I could not get any *N. northiana* seed and only got a few cuttings so as not to decimate the colony. It appears that this species was preyed upon by man and so I never got rooted plants. I normally have no problems with cuttings on any species to date, but this species seems rather difficult to strike. I may have to layer plants in the future for success.

The *N. spectabilis* on G. Pangulubao are different than on G. Sibayak as they are darker, very hirsute and leaves are not petiolate at all but are decurrent and yet they are still considered the same species. We also found *N. trichocarpa* in Sibolga and Kuching. This is a lowland hybrid and all our species were highland.

Want Ad

Charles Webb (Rt. 3, Box 241C, Vergenues, VT 05491).
WANTED TO BUY: *Heliamphora, Genlisia, and Aldrovanda.*

Christopher A. Belanger (988 Brightwood Drive, Toms River, NJ 08753):
TRADE: *Utricularia quelchii* for *U. campelliana* and/or *U. jamesoniana.* (WT) *U. blanchetii, U. buntingiana, U. chrysantha, U. costata, U. lloydii, U. praetermissa, U. endresi, U. oliverana, U. reniformis, U. tenuissima* and any other South American *Utricularia.* (WT) *Pinguicula filifolia, P. crenatiloba, P. balcanica* and any other Mexican *Pinguicula.* (WT) Any Austrailian Pygmy *Drosera.* (W) Contact from CP enthusiasts worldwide. Please send me your list.

Nepenthes Growing Media

By David E. Butler, 127 Wright Road, Concord, MA 01742

The subject of growing media for *Nepenthes* has not been extensively explored. Frequently, writers cover the subject with a generalization. Such sources often contain general references to long fiber sphagnum. This observation, incidentally, is not entirely directed at others. For example, a prior note, CPN 16:83-87 (1987), surveyed some cultural variables for growing *Nepenthes* under lights, but made only a summary reference to long-fiber sphagnum as a growing medium. Certainly, long fiber is a good starting point for discussion, but there are some choices and alternatives. These choices become more important as the *Nepenthes* collection expands from the generally available, easily grown varieties, to rarer and more difficult species or hybrids.

True, many *Nepenthes* species and hybrids take well to long fiber sphagnum, as well as a variety of other growing media. However, sphagnum is not infallible. In particular, sphagnum can become waterlogged. This condition can lead to root rot. I lost specimens of *N. reinwardtiana* and *N. albo-marginata* using this medium, apparently because of waterlogged root systems. Thus it is sometimes desirable to have a medium which provides greater aeration and drainage than pure sphagnum. Indeed, as one gets away from the morecommonly grown species and hybrids, several species demand a medium which, for all practical purposes, is an epiphytic mix. This requirement suggests that some orchid media, either alone or mixed with sphagnum, have some relevance to growers of *Nepenthes*.

Interestingly, the orchid world has discovered that many orchids do well in sphagnum or sphagnum mixes. One of the larger suppliers of growing media and potting supplies to the orchid community is OFE International. Of course, if one is an orchid grower, there is sphagnum and then there is sphagnum. The hot item in the orchid world currently sees to be New Zealand sphagnum moss. OFE, in a recent catalog, offered New Zealand long fiber in 1/4 cubic foot bags, one and five kilo boxes, as well as New Zealand short fiber. Moss is shipped dry, and a one kilo box is pretty good size for a hobbyist. An article in the March, 1989 American Orchid Society Bulletin, titled The New Sphagnum Moss from New Zealand, by Ann and Jim Mann, discusses the advantages of New Zealand moss. According to the Manns, New Zealand moss is a robust, resilient species, *Sphagnum cristatum*, which grows in the Pahiki swamps of New Zealand's south island, reaching a height of several inches. It is clean when harvested, according to the Manns, and also is picked over to remove leaves and debris. My experience is that New Zealand moss is indeed freer from leaves, sticks and grass than moss from domestic sources. I have no independent knowledge on this subject.

The Manns go on to assert that, because the moss is clean, and deemed to be free of soil, insects or fungi, they do not fear contacting sporotrichsis when handling it. This latter assertion has triggered some debate in the orchid literature. In the May, 1989 AOS Journal, Dr. Isadora Rudnikoff commented on the Mann article. She related that she had sent some New Zealand sphagnum to a hospital laboratory for analysis. Fungus culture yeilded the presence of the *Mucoracea* group, which Dr. Rudnikoff asserted is pathogenic to humans, citing as an example *Mucomycosis*. She called for an independent investigation.

The better view may be that no unsterilized organic matter is free of potential disease causing organisms. Perhaps the Manns confused absence of visible signs of soil, insects or fungi with the total absence of such factors. Consequently, one should take the same precautions when handling New Zealand moss as when handling other sphagnum. Again, I do not presume to know the "right" precautions, but parental

common sense suggests that one keep the moss in a closed container, use it in a well ventilated area, not handle it when open wounds such as cuts and scratches are present on the hands. Individuals predisposed to infection obviously should carefully consider their options. Above all, say your prayers and brush your teeth regularly.

According to the Manns, the Japanese are the world's largest importers of New Zealand sphagnum. New Zealand's exports of this commodity have grown from under 10 metric tons in 1977 to 640 tons in 1987. Genera said to be grown using New Zealand moss include phalenopsis, cattleyas, oncidiums and disas the beautiful south african terrestrials which have been photographed growing next to *Drosera capensis*. The Manns also mention the long lasting nature of the medium. Not surprisingly, they are also a commercial source for New Zealand moss.

OFE also has offered Canadian green long fibered sphagnum and Florida long fibered sphagnum, which I have no experience with. I general use New Zealand moss. Although I do not agree with all the claims made for it, I have found it to be an excellent growing medium. However, in view of the potential health hazards which are not yet well-defined, I would not recommend it to others except at their own risk.

OFE and others also offer epiphytic mixes. OFE, for example, offers a *Phalenopsis* mix consisting of New Zealand sphagnum, cork nuggets and charcoal. The mix alone dries out to quickly for my conditions, but when mixed with an equal amount of sphagnum, works very well. In particular, this mix avoids many of the root rot problems of straight spagnum. Other epiphytic mixes appropriate for *Nepenthes* do not contain any sphagnum. For example, Slack, a leading authority on CP cultivation, has suggested either sphagnum or, as an alternative, a mix of peat, orchid bark and perlite. Kensington Orchids, another supplier of orchid potting media, offers a *Cattleya* mix which contains similar ingredients, although apparently not in the same proportions recommended by Slack. Bill Scholl, as experienced *Nepenthes* grower, has reported that his plants do well in bark chips. He uses hardwood chips which are a side product of many industrial establishments. Pring (1943), a pioneer cultivator and hybridizer of *Nepenthes*, stated that he used three parts orchid peat to one part sphagnum moss (Pring also wrote that he applied liquid cow manure to stimulate pitcher formation. In deference to other members of the household, the Pring fertilization method has not yet been applied to my collection).

Two varieties which now grow in a strictly epiphytic mix in my collection are *N. tentaculata* and *N. veitchii*. *N. veitchii*, a seedling, appears content in the Kensington cattleya mix with a top dressing of peat/sand/perlite. *N. tentaculata* is in the grower's mix, which appears to be hardwood chips or shavings. Approximately two dozen other *Nepenthes* variants are doing well in mixes of ordinary sphagnum, New Zealand sphagnum and/or OFE *Phalenopsis* mix. These include *N. alata, boschiana, coccinea, khasiana, merriliana, reinwardtiana, trichocarpa, tobiaca, truncata, ventricosa*, and several *ventricosa* hybrids, as well as several recent additions. Plants which grow in straight sphagnum include *N. boissiense rubra, infundibuliformis, mastersiana*, and *superba*. I use sphagnum with these primarily because they tend to dry out more quickly, due to the size or vigor of the plant.

In addition, Bill Scholl has grown *N. ventricosa* in straight sand. The plants grown in this media are reportedly smaller in size than plants of comparable age in wood chips. This feature may in fact be desirable for growers with a space problem. Perhaps it would be useful for CPN readers to write in to discuss their growing media. If readers wish to write to me, I will attempt to collate the answers for future use.

SUPPLIERS which have recently advertised New Zealand sphagnum or bark mixes in the AOS Bulletin include the following:

OFE International, Inc.
P.O. Box 161302
Miami, FL 33116

Ann Mann's Orchids
9045 Ron-Den Lane
Windermere, FL 32786-9238

A & P Orchids
Peters Road
Swansea, MA 02777

Kensington Orchids
3301 Plyers Mill Road
Kensington, MD 20985
(has not offered sphagnum)

The above listing should not be viewed as an endorsement. I do not endorse any of these sources not do I have any financial interest in them.

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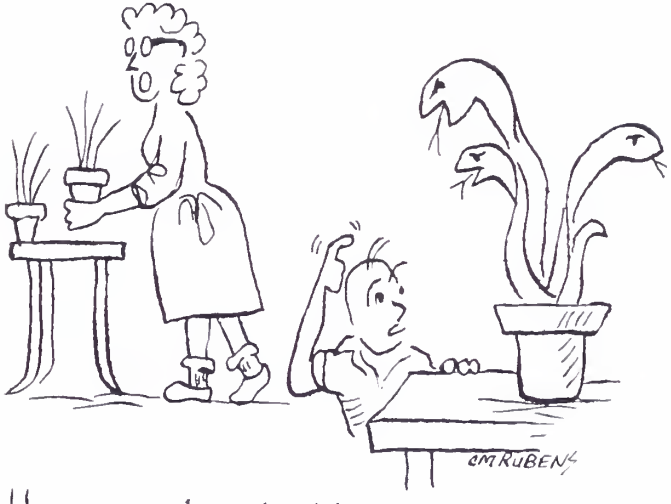
TIDBITS

Sent in by: Connie Rubens



"Use your imagination, junior... it's really a plant."

The Fascination with Carnivorous Plants in Juvenile Literature

By Rudolf Schmid, Deptartment of Integrative Biology
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Introduction

Carnivorous plants have received much attention even since Charles Darwin's Insectivorous plants (1875, 2nd 1888 rev. by Francis Darwin). The most recent contribution is B. E. Juniper, R. J. Robins, and D. M. Joel's The carnivorous plants (Academic Press, London, 1989, xii, 353 pp., B&W illus.), a superb and most scholarly treatise. Adrian Slack's excellent Carnivorous plants recently received a limited revision (Alphabooks, London, 1988, 240 pp., B&W and color illus., original editions by Ebury Press, London, 1979, The MIT Press, Cambridge, Massachusetts, 1980, both also 240 pp.). However, juvenile literature (juvenilia) on plant carnivory has not been neglected. There are in English at least ten fairly recent juvenile books on carnivorous plants (hereafter "CPs" except in titles of works). Nine of these have been systematically listed in CPN's annual "list of CP books" since its initiation in 1976 (5:17); Rahn's book has not been listed. The ten juvenilia on CPs are listed below and include the following information:

(1) complete bibliographic details, including ISBN/price information and publisher's detailed address if in print (information was verified with publishers in Oct. 1989);
(2) a listing of their chapter headings (the spelling of authors is retained) to indicate both the contents and the flavor of the book, including in brackets an indication of the plant and fungal organisms treated (see Table 1, note 1, for abbreviations of genera);
(3) citation of published reviews in CPN, Appraisal: Science books for young people (1967-date), or BRD (Book review digest, H. W. Wilson Co., New York), the last work a compilation available in most public libraries (I do not cite CPN's annual "list of CP books") [Appraisal has dual reviews from the viewpoints of a librarian and a specialist, who each rate the work: E = excellent; VG = very good; G = good; F = fair; U = unacceptable; Q = qualification or explanation necesary];
(4) my commentary, including notation of age level (usually taken from Appraisal, occasionally from BRD).

The following ten juvenilia are discussed alphabetically by author. Tables 1-2 list the works and give comparative information on their scientific contents (Table 1) and bibliographic details (Table 2).

Juvenilia on carnivorous plants

(1) ***Bentley, Linna.*** 1968. Plants that eat animals. Illustrations by Colin Threadgall. McGraw-Hill Book Co., New York. 31, [1] pp., illus. (B&W, color paintings), color endpaper illus. [A McGraw-Hill Natural Science Picture Book. Also published by The Bodely Head, London, 1967.] Out-of-print.

Contents: plants that catch animals; four plant traps; simple stickey-surface traps—the butterworts [Pi]; sticky-surface traps with tentacles—the sundews [Dr, Drp, By]; the sundew trap in action; the deadly jug-of-water trap—pitcher plants (the Australian pitcher plant; the American pitcher plant; an American pitcher plant in action; the tropical pitcher plants) [Ce, He, Da, Sa, Ne]; the lightning snap trap—venus

fly trap [Di]; the snap trap in action; suction traps—the bladderworts [Ut]; suction traps—the underwater bladderworts [Ut]; the suction trap in action; botanical gardens; no index.

Reviews: M. H. Perkins and F. Sherburne, Appraisal 2(3):4 (1969) (VG/VG, ages 8-12); various authors, BRD 65:102 (1969).

Comments: Intended for ages 8-12, this work is in appealing picture-book format, 25 x 19 cm., and thus has rather skimpy text. Curiously, however, scientific names are used throughout (Chrysamphoa is used for Darlingtonia), and the treatment is worldwide. The rather stylized color and black-and-white illustrations by Colin Threadgall make this work artistically much superior to most of the juvenilia mentioned here except for Lerner's work, which has realistic watercolors, and Overbeck's and Wexler's atlases, which have superb photography. Admirably, Bentley's coverage of CPs is worldwide.

(2) ***Dean, Anabel.*** 1977. Plants that eat insects: A look at carnivorous plants. Illustrations by L'Enc Matte. Lerner Publications Co., Minneapolis. 32 pp., illus. (B&W sketches, color covers). Out-of-print.

Contents: meat-eating plants; the Venus's-flytrap [Di]; sundews [Dr]; butterworts [Pi]; bladderworts [Ut]; fungi [Arthrobotrys]; pitcher plants (common pitcher plant; cobra plant) [Sa, Da]; no index.

Reviews: A. L. Phillips and R. G. Belcher, Appraisal 10(3):16 (1977) (VG/VG, ages 10 and up).

Comments: Intended for ages 10 up, this farily elementary work has brief text supported by L'Enc Matte's simple sketches. Scintific names are not used. The novelty of this book on CPs is that for one aimed at a lower age level it also covers fungi predaceous on nematodes.

(3) ***Goldstein, Philip.*** 1974. Animals and plants that trap. Illustrations by Matthew Kalmenoff; photographs from various sources. Holiday House, New York. 118, [10] pp., illus. (B&W sketches, photographs). Out-of-print.

Contents: a better mousetrap; adaptation—the secret of survival; an unusual insect trap [Arum]; a very effective pitfall [ant lion]; the snap-trap of Venus [Di]; the web of the caddis worm; walk into my parlor [spiders]; the sparkling dewdrop trap [Pi, Dr]; the stringing-cell trap [hydra]; faster than the eye can see [Ut]; the fish that goes fishing [anglerfish, batfish, etc.]; the death pit [Ne, Sa]; a lasso for an eelworm [Arthrobotrys and other fungi]; annotated 5-page bibliography; 5-page index.

Reviews: none in Appraisal, BRD, or CPN.

Comments: Intended for ages 12-18 (my estimate as there are no reviews), this detailed work covers the same topics as Rahn, often in a more thorough fashion. This work has many good illustrations by Matthew Kalmenoff and several fine photographs borrowed from various sources. Unfortunately, there is no overview on trap mechanisms, and accounts of plants and animals are curiously integrated. Scientific names are used.

(4) ***Lerner, Carol.*** 1983. Pitcher plants: The elegant insect traps. Illustrations by the author. William Morrow and Co., New York. 63, [1] pp., illus. (B&W sketches, watercolors). ISBN 0-688-0171707, $12.95, ISBN 0-688-01718-5 (library binding), $12.88 (from William Morrow and Co., 105 Madison Ave., New York, New York 10016, 800-843-9389).

Contents: plants of prey; pitcher plants (where they grow; the pitcher leaf; some leaf variations; pitcher flowers); prey and parasites (the victims; the plunderers; a special relationship); epilogue; 2-page glossary; collections of pitcher plants open to the public; 3-page inex; bionote. Mostly on North American Sarraceniaceae (Da, Sa), but with sketches and very brief mention of other North American CPs (Di, Dr, Ut).

Reviews: R. G. Beebe and C. C. Truesdell, Appraisal 16(3):38-39 (1983) (E/G, ages 10-15); various authors, BRD 79:866 (1983); D. E. Schnell, CPN 12:53 (1983).

Comments: Intended for ages 10-15, this is a superb and handsomely illustrated discussion of the nine species (scientific names are given) of North American Sarraceniaceae. In its treatment of "plumderers," that is, insects eating the "eaters," this work covers a topic not usually treated in books on plant carnivory. Lerner's seven watercolor paintings of the nine species are very elegant. There are also many clear B&W drawings and one map.

(5) ***Overbeck, Cynthia.*** 1982. Carnivorous plants. Photographs by Kiyoshi Shimizu. Adapted from a translation by Chaim Uri of Kiyoshi Shimizu's Shokuchú shokubutsu (1975). Lerner Publications Co., Minneapolis. 48 pp., illus. (color photographs, color covers). [A Lerner Natural Science Book.] ISBN 0-8225-1470-2 (trade/library binding), $12.95, ISBN 0-8225-9535-4 (paperbound), $4.95 (from Lerner Publications Co., 241 First Avenue, Minneapolis, Minnesota 55401, 800-328-4929).

Contents: no chapter headings used; 1-page glossary; 1-page index. On Al, Di, Dr, Ne, Pi, Sa, and Ut.

Reviews: R. S. Beebe and G. O. Blough, Appraisal 16(1):64-65 (1983) (Q/VG, ages 10-12).

Comments: Intended for ages 10-12, the entire A Lerner Natural Science Book series (11 books on plants, 25 on animals) comprises adaptations from various Japanese juvenilia. All works sport excellent and intricate color photographs. Unfortunately, scientific names are not used in Overbeck's Carnivorous plants, which is clearly written. Shimizu's color photographs are very fine and the ones of waterwheel (Aldrovanda vesiculosa) are the best I have seen, indeed a most significant contribution to the "very limited literature" on this monotypic plant lamented by B. E. Juniper et al. in The carnivorous plants (1989:17). Juniper et al. actually cite Overbeck on p. 53.

(6) ***Poole, Lynn and Gray Poole.*** 1963. Insect-eating plants. Illustrations by Christine Sapieha. Thomas Y. Crowell Co., New York. [vii], 87, [1] pp., illus. (B&W sketches). Out-of-print.

Contents: eaten alive!; diet of insects; Venus' flytraps [Di]; sundews (including butterworts) [Dr, Pi]; pitcher plants [Sa]; the cobra [Da]; bladderworts [Ut]; fungus with lasso [Arthrobotrys]; terrarium; care and feeding; keeping a record; 4-page index; bionote.

Reviews: various authors, BRD 60:942 (1964).

Comments: Intended for ages 10-13, this work has clear and often lively discussion married to very mediocre sketches by Christine Sapieha. The last three chapters on growing and experimenting with CPs are very thorough. Scientific names are general used.

(7) ***Prince, Jack Harvey ("J. H.").*** 1979. Plants that eat animals. Illustrations and photographs by the author. Thomas Nelson, Publishers, Nashville. 92 pp., illus. (B&W diagrams, photographs). Out-of-print.

Contents: introduction; classification of CPs (glands, digestion, enzymes, osmosis); underwater traps (bladderworts) [Ut, Bi, Po, Al, Ge]; pitfall traps (pitcher plants) [Ne, Ce, Sa, Da, He]; flypaper traps (sundews; rainbow plants; butterworts) [Dr, Drp; By; Pi]; snap traps (Venus's-flytrap) [Di]; predaceous fungi (adhesive fungi; ring traps; penetration by spores; bait traps) [Arthrobotrys, etc.]; vase traps (Aechmea, etc.—see comments following); growing CPs at home (Venus's-flytraps; sundews; pitfall traps; butterworts; bladderworts; bromeliads); 1-page bibliography; 2-page glossary; 2-page list of 75 scientific names; 6-page index.

Reviews: M. Bush and W. D. Perkins, Appraisal 12(3):45-46 (1979) (F/F, ages 8-12); various authors, BRD 76:978 (1980).

Comments: This work, which is intended for ages 8-12 according to Appraisal but more accurately, I think ages 12-18 according to BRD, is quite detailed and has a good introductory chapter placing things in perspective. However, it suffers from the author's unimpressive diagrams and photographs. In addition, the text is dry and often difficult, indeed probably too textbookish for many juveniles. Scientific names are used; common names used in the text are number-referenced to a so-called glossary of scientific names. Prince treats CPs, predaceous fungi, and bromeliad tank plants, the last curiously called "vase traps". The bromeliaceous genera mentioned are not carnivorous, that is, the probably carnivorous Brocchinia and Catopsis of Bromeliaceae (see Juniper et al.'s The carnivorous plants, 1989).

(8) ***Rahn, Joan Elma.*** 1980. Traps & lures in the living world. Illustrations and photographs by the author. Atheneum, New York. [vii], 94 pp., illus. (B&W diagrams, photographs). Out-of-print.

Contents: introduction; "will you walk into my parlor?" [spiders, caddis fly, ant lion]; CPs and predaceous fungi [Di, Ut, Sa, Da, Pi, Dr, Arthrobotrys]; tender traps [Calycanthus, Aristolochia]; femmes fatales, fishing fish, and others that lure ["solar furnace" plants—Geum, Papaver; Stapelia carrion flowers; various animals (fireflies, fungus gnats, flashlight fish, angler fish, bolas spikers, crab spider)]; 7-page glossary; 3-page index.

Reviews: various authors, BRD 77:1171 (1981).

Comments: Intended for ages 11-14, this book is broader, treating not only the usual CPs but also trap flowers and fungi (Arthrobotrys) predaceous on nematodes. The book, with several photographs and many very prosaic diagrams by the author, has a very good glossary. Scientific names are only very occasionally used.

(9) ***Waters, John Frederick ["John F."].*** 1974. Carnivorous plants. Illustrations and photographs from various sources. Franklin Watts, New York. [viii], 60, [1] pp., illus. (B&W diagrams, artwork, photographs, color covers). [A First Book] Out-of-print.

Contents: what is a plant?; what is a CP?; pitcher plants [Sa, Da, Ne]; bladderworts [Ut]; sundews [Dr, Drp]; the Venus flytrap [Di]; butterworts [Pi]; animal-capturing fungi [Arthrobotrys, etc.]; 2-page glossary; 1-page bibliography; 2-page index; bionote.

Reviews: J. C. Botsford and P. B. Care, Appraisal 8(3):38 (1975) (E/VG, ages 9-12); none in BRD or CPN; notice by D. E. Schnell and J. A. Mazrimas, CPN 4:52 (1975), refers to the "many . . . fanciful" "line drawings".

Comments: Intended for ages 9-12, this work is nicely illustrated with five photographs by Charles Phelps Cushing and many paintings, diagrams, and photographs borrowed from the Field Museum of Natural History, Chicago, and the New York Public Library; unfortunately the originals are not noted. A two-page spread curiously depicts eight epiphytes, including Dischidia rafflesiana complete with its German captions. Scientific names are liberally used (Chrysamphora is used for Darlingtonia). The bibliography given is not on CPs!

(10) ***Wexler, Jerome.*** 1981. Secrets of the Venus's fly trap. Photographs by the author. Dodd, Mead & Co., New York. [64] pp., illus. (B&W photographs). Out-of-print.

Contents: the trap; the plant; reproduction; growing your own; no index. On Di only.

Reviews: H. Kent and P. Stowe, Appraisal 15(1):67 (1982) (VG/G, ages 8-12); various authors, BRD 77:1513-1514 (1981); S. E. Williams, CPN 10:82-83 (1981).

Comments: This picture also intended for ages 8-12 was done by Jerome Wexler, a very prolific contributor to botanical literature both as an author and especially as a photographer. The atals contains some very excellent, indeed stunning, photography along with a straightforward discussion of the morphology and trap mechanism of Venus flytrap (Dionaea muscipula). Scientific names are not used, and the pages are unnumbered.

Conclusions

The aforediscussed books are entirely or substantially on CPs. However, this subject naturally also receives brief mention in various encyclopedia-type works. Some examples: (1) Mark Lambert's Plant life (Warwick Press, New York, 1983, 91, [4] pp., color illus., ISBN 0-531-09216-X, $8.00, A Gateway Fact Book, grades 4-6, from Franklin Watts, 387 Park Avenue South, New York, New York 10016) has two pages (pp. 46-47) of very simple color illustrations on "plants that eat animals"; for review see R. S. Beebe and R. G. Belcher, Appraisal 17(2):26 (1984) (VG/G, ages 9-14). (2) David Black and Anthony Huxley's Plants (Facts on File Publications, 460 Park Avenue South, New York, New York 10016, 1985, 64 pp., color illus., ISBN 0-8160-1065-X, $14.95, The World of Science series, grades 3-6, also Orbis Publishing, London) has a two-page spread (pp. 54-55) on CPs, with some beautiful photographs; for review see B. C. Scotto and P. Stowe, Appraisal 19(4):23-24 (1986) (E/VG, ages 10-14). (3) World Book staff's The plant world (World Book, Chicago, Illinois, 1985, 159 pp., color illus., no ISBN, The World Book Encyclopedia of Science series, not available individually, series ISBN 0-7166-3192-X, 8-vol. set $90.00, grades -12) is an extensive treatment of the plant and fungal kingdoms, with emphasis on ecology and plant products, but sporadically treats CPs (pp. 61, 65, 81), including some excellent color photographs of *Dionaea, Drosera,* and *Utricularia* (pp. 79, 80, 107).

In addition, works focusing on other topics of botany may breifly treat CPs. (1) Ware T. Budlong's Performing plants (Simon & Schuster, New York, 1969, 96 pp., B&W sketches by Grambs Miller) has a seven-page chapter on CPs (pp. 25-31) covering Venus flytrap, butterworts, sundews, and pitcher plants; for review see F. Doughty and F. Sherburne, Appraisal 2(3):6-7 (1969) (G/VG, ages 12 up). (2) Dorothy Childs Hogner's Water plants (Holiday House, New York, 1977, 96 pp., B&W illus.) has a photograph and sparse description (pp. 34-36) of *Utricularia*; for review see R. Alkema and R. G. Belcher, Appraisal 12(1):17-18 (1979) (F/G, ages 9-12). (3) Laurence Pringle's Water plants (Thomas Y. Crowell, New York, 1975, 35 pp., color illus. by Kazue Mizumura) similarly considers bladderwort; for review see J. Gulovsen and P. B. Care, Appraisal 9(2):34 (1976) (VG/VG, ages 5-10).

Tables 1 and 2 give comparative data on the ten juvenile books on CPs discussed above. Most works treat the prerequisite six American genera, namely, Venus flytrap, bladderworts, butterworts, sundews, pitcher plants, and cobra lily, respectively, Di, Ut, Pi, Dr, Sa, and Da in Table 1. Some of these works (e.g., Bentley, Goldstein, Overbeck, Prince, Waters) also treat Australian or tropical CPs, whereas two books are more restrictive in treating only a few CPs (Lerner on North American Sarraceniaceae, Wexler on *Dionaea*). Interestingly, the two works treating the greatest number of genera of CPs are the most advanced (Prince) and among the most elementary (Bentley). None of these juvenilia consider Triphyophyllum, Bromeliaceae, and other recent examples of CPs discussed in Slack (1988) and Juniper et al. (1989). Surprisingly, only two books (Bentley, Lerner) list public collections of CPs, and only five (Goldstein, the Pooles, Prince, Waters, Wexler) give information on cultivating CPs (Table 1).

Six works, those by Dean, Goldstein, the Pooles, Prince, Rahn, and Waters, extend beyond CPs and treat not only other plants, but also fungi and animals (Table 1). The aforenoted six books consider various fungi predaceous on animals, a topic, incidentally, that was not part of my eduction until fairly recently. Waters's efforts briefly considers epiphytes and plants in general. And three works are the most broad (Table 1), treating not only trap flowers such as Aristolochia and other types of plants (Goldstein, Prince, Rahn), but also various animals that lure and trap (Goldstein, Rahn).

Table 2 compares various bibliograhic details for these ten juvenillia on CPs. Several books aimed at the lower age levels (Bentley, Dean, Wexler) lack indices. Two of these (Dean, Wexler) and, surprisingly, an otherwise excellent advanced book (Overbeck) do not give scientific names. Table 2 shows well how spotty juvenilia can be with such essentials for science books as glossaries and bibliographies. Goldstein's five-page, annotated bibliography and Rahn's seven-page glossary are especially commendable.

The two most recent works (Lerner, Overbeck) as well as a 1968 book (Bentley) are partly or entirely in color. Except for color covers or dust jackets, the remaining seven items (Table 2) are strictly in black-and-white. This tendency toward color production parallels the trend in juvenilia on other topics (see R. Schmid, 1990, some recent botany books for children and young adults, especially the artistry of Carol Lerner and Anne Ophelia Todd Dowden, Taxon 39:81-92).

The topic of the CPs is one especially susceptible to sensationalistic language, particularly in literature for juveniles and the adult public. Fortunately, the juvenilia discussed here are reasonably good in this matter, as are, in fact, most recent science juvenilia [G. O. Blough, 'Even better than jelly beans', Appraisal 6(2):1-4 (1973)]. Unfortunately, three of the works (Bentley, Dean, Prince, published, respectively, 1968, 1977, 1979) in their titles, plus the Lambert encyclopedia discussed above, use that hoary word "eat". This usage "eat" is notably bad because the word is popularly defined as "to take in through the mouth as food: ingest, chew, and swallow in turn" (Webster's 9th New Collegiate Dictionary, 1983). Fortunately, the two most recent works (Lerner, Overbeck) are exemplary in using scientifically accurate language.

Predictably, juvenilia on CPs rarely receive mention in more specialized works on the subject. Of the ten juvenilia discussed here, Juniper et al.'s (1989) recent The carnivorous plants cites only Overbeck's atlas for its superb pictures of *Aldrovanda*. Slack (1988) cites none of these juvenilia.

While some of the juvenilia discussed above are at a fairly elementary level (see "age" notations above and in Table 2), most are at an appreciably higher, even "young adult" level. Libraries and publishers commonly divide juvenile literature into "children's literature" for preschool through age 12 (grade six) and "young adult literature" for ages 12-18 (grades 7-12). Several works discussed here, for instance Lerner's Pitcher plants, Overbeck's Carnivorous plants, and Wexler's Secrets of the Venus's fly trap would not be out of place in college or university taxonomy or morphology classes to depict the various taxa treated. These three works have especially fine illustrations, respectively, watercolor paintings, color photographs, and black-and-white photographs. The advantage of using juvenilia in college or university teaching is that such works are very visual—long on pictures and short on words, the reverse of treatments in adult and technical works. If necessary, one can make an aside to the students to enjoy the illustrations but not to be offended by the elementary text.

TABLE 1. COMPARATIVE DATA ON SCIENTIFIC CONTENTS OF THE TEN JUVENILE BOOKS ON CARNIVOROUS PLANTS[1]

Author(s) (year)	Cult.	Collec.	Al	Bi	Br	By	Ce	Da	Di	Dr	Drp	Ge	He	Ma	Ne	Pi	Po	Sa	Tr	Ut	Pls	Fun	Ani
Bentley (1968)		yes				By	Ce	Da	Di	Dr	Drp		He		Ne	Pi		Sa		Ut			
Dean (1977)								Da	Di	Dr						Pi		Sa		Ut		Fun	
Goldstein (1974)	yes								Di	Dr					Ne	Pi		Sa		Ut	Pls	Fun	Ani
Lerner (1983)		yes						Da	x^2	x^2								Sa		x^2			
Overbeck (1982)			Al						Di	Dr					Ne	Pi		Sa		Ut			
the Pooles (1963)	yes!							Da	Di	Dr						Pi		Sa		Ut		Fun	
Prince (1979)	yes!		Al	Bi		By	Ce	Da	Di	Dr	Drp	Ge	He		Ne	Pi	Po	Sa		Ut	Pls	Fun	
Rahn (1980)								Da	Di	Dr						Pi		Sa		Ut	Pls	Fun	Ani
Waters (1974)	yes							Da	Di	Dr	Drp				Ne	Pi		Sa		Ut	Pls	Fun	
Wexler (1981)	yes!								Di														

[1] Key to abbreviations: Information mostly from Juniper et al. (1989); numbers in parentheses indicate numbers of species in genera of CPs.

Cult. = information on cultivation of CPs; "!" indicates that a special chapter is devoted to cultivation.

Collec. = information on public collections of CPs

Al = Aldrovanda (waterwheel--Droseraceae) (1)

Ani = animals (see text)

Bi = Biovularia (Lentibulariaceae) (2)

Br = Bromeliaceous CPs (see text and Juniper et al., 1989)

By = Byblis (rainbow plant--Byblidaceae) (2)

Ce = Cephalotus (Australian pitcher-plant--Cephalotaceae) (1)

Da = Darlingtonia (cobra plant, cobra lily--Sarraceniaceae) (1)

Di = Dionaea (Venus's fly-trap--Droseraceae) (1)

Dr = Drosera (sundew--Droseraceae) (110)

Drp = Drosophyllum (Portuguese sundew, dewy-pine--Droseraceae) (1)

Fun = Arthrobotrys and other fungi (see text)

Ge = Genlisea (Lentibulariaceae) (15)

He = Heliamphora (sun-pitcher, marsh-pitcher--Sarraceniaceae) (5)

Ma = Martyniaceous CPs (see Juniper et al., 1989)

Ne = Nepenthes (pitcher-plant, Dutchman's pipe, monkey's cup--Nepenthaceae) (68)

Pi = Pinguicula (butterwort--Lentibulariaceae) (52)

Pls = plants other than CPs (see text)

Po = Polypompholyx (pink petticoat--Lentibulariaceae) (2)

Sa = Sarracenia (pitcher-plant, trumpet-leaf--Sarraceniaceae) (8)

Tr = Triphyophyllum (Dioncophyllaceae) (1) (see text, Juniper et al., 1989, and Slack, 1983)

Ut = Utricularia (bladderwort--Lentibulariaceae) (200)

[2]With sketches and very brief mention of these taxa.

TABLE 2. COMPARATIVE BIBLIOGRAPHIC DATA ON THE TEN JUVENILE BOOKS ON CARNIVOROUS PLANTS[1]

Author(s) (year)	Age level[2]	Number pages	Drawings[3]	Photos[3]	Maps	SciName used	Glossary pages	Biblio. pages	Index pages
Bentley (1968)	8-12	32	B&W/color			yes			
Dean (1977)	10 up	32	B&W						
Goldstein (1974)	12-18	128	B&W	B&W		yes		5	5
Lerner (1983)	10-15	64	B&W/color		yes	yes	2		3
Overbeck (1982)	10-12	48		color			1		1
the Pooles (1963)	10-13	95	B&W			yes			4
Prince (1979)	12-18	92	B&W	B&W		yes	2	1	6
Rahn (1980)	11-14	101	B&W	B&W		yes	7		3
Waters (1974)	9-12	69	B&W	B&W		yes	2	1	2
Wexler (1981)	8-12	64		B&W					

[1]Values for "0" or "no" not indicated. "SciName used" means that at least generic names were used. See text for elaboration.

[2]Age levels taken from reviews in Appraisal (see text) except BRD used for the Pooles, Prince (Appraisal indicates less accurately ages 8-12), and Rahn, and my estimate for Goldstein.

[3]Excluding covers. Dean and Overbeck have color photographs on their covers, whereas Waters has color drawings on the covers.

European *Pinguicula* Species
Taxonomy - Distribution - Cultural Conditions

By Alexander Mrkvicka; Hopflergesse (6/16/1/4, A-1230, Wien Austria)

The butterwort family encloses about 50 species worldwide, 12 of these are inhabitants of Europe and the adjacent parts of Asia, but only two are widespread in this region. CASPER (1966) delineated three groups which he divided according to floral structures and vegetative organs into 12 Sections:

I. Corolla consists of 5 more or less equally sized lobes of different colors, including yellow flowers.
   - A. Spur short, bent; no palate developed.
     1. Sect. Agnata CASPER; *P. agnata, P. albida*
     2. Sect. Discoradix CASPER; *P. lignicola*
   - B. Spur long, slightly bent; no palate
     3. Sect. Heterophyllum CASPER; *P. heterophylla*
   - C. Spur short, bent; palate developed
     4. Sect. Isoloba BARNH; *P, caerulea, P. lilacina, P. lusitanica, P. lutea*
   - D. Spur long, stretched, straight; palate developed
     5. Sect. Cardiophyllum CASPER; *P. crystallina, P. hirtiflora*

II. Corolla consists of two lips, the lower enlarged, middle lobe different; different colors including yellow; spur short.
   - A. Minute corolla; spur long in proportion to corolla; palate vague
     6. Sect. Temnoceras (BARNH) CASPER; *P. crenatiloba*
   - B. Corolla larger; spur short; pouchlike; palate developed
     7. Sect. Ampullipalatum CASPER; *P. antarctica, P. elongata*
   - C. Corolla with very large middle-lobes; spur short, pouchlike; palate vague
     8. Sect. Micranthus CASPER; *P. alpina, P. ramosa, P. variegata*

III. Corolla two-lobed; spur long, narrow
   - A. Corolla-tube wide; spur short in proportion to corolla
     9. Sect. Homophyllum CASPER; *P. jackii*
   - B. Corolla-tube short; spur very long
     10. Sect. Orcheosanthus DC.; *P. colimensis, P. gypsicola, P. moranesis*
   - C. Species developing hibernacula in winter; corolla-tube funnel-shaped; spur variable
     11. Sect. Pinguicula no yellow colors; *P. balcanica, P. corsica, P. grandiflora, P. leptoceras, P. longifolia, P. macroceras, P. nevadensis, P. vallisneriifolia, P. vulgaris*
     12. Sect. Nana CASPER yellow colors; *P. villosa*

Distribution

P. alpina and *P. vulgaris* can be found in the northern temperate and mountainous regions all over the world, all other European species are restricted to different, mostly mountainous regions in various parts of Europe.

Pinguicula bohemica KRAJINA (which is taxonomically disputed and differs from *P. vulgaris* in the structure of flowers and fruits) is the most endangered species, it is restricted to a few bogs in Czechoslovakia and nowadays nearly extinct.

The development of the section *Pinguicula* began probably in the central mediterranean region, this hypothesis is also supported by karyological differences and the ocurrence of the diploid "relic" *Pinguicula corsica*.

Pinguicula vulgaris has developed the highest chromosome numbers (8x64) and seems to be the youngest and most successful member of the Section.

Map 1 shows the geographical distribution:

Cultural Conditions

Only a few European species (*P. longifola, P. nevadensis, P. vallisneriifolia*) are not yet grown by CP-enthusiasts and in botanical gardens. The following species are available or will be available soon from various sources:

Species	Cult. Conditions
P. alpina	1
P. balacanica	1
P. bohemica	1
P. corsica	1
P. crystallina	2
P. grandiflora	1
P. hirtiflora	2
P. leptoceras	1
P. lusitanica	2
P. vulgaris	1

Cultural Conditions 1:

Special with winter-hibernacula
Soil: Peat and sand 1:1
All these species need a period of dormancy at about 5°C for at least 2 months in winter (eventually stored in a refrigerator) to survive for many years.
Summer temperatures should not exceed 23°C for longer periods, a slightly shaded place is suitable in summer.
If possible, these species should be kept outdoors.
The plants are not repotted at all to avoid root-damage.
Multiplication by seed, buds and leafcuttings.

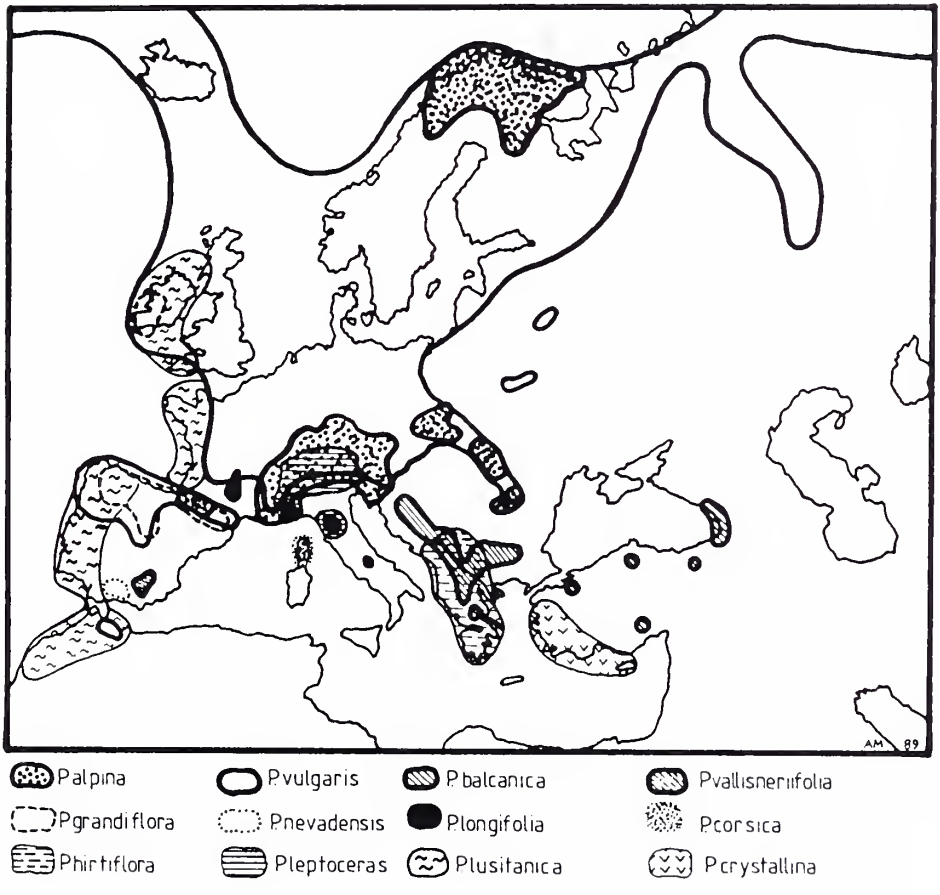
Cultural Conditions 2:

Species without hibernacula
Soil: Peat and sand 1:1
A slightly shaded place is suitable, also a terrarium with fluorescent bulbs or an outdoor-bog.
High temperatures are not problem, bu the plants should be kept moist, never we in winter. Be careful to keep the leaves dry in winter!
Multiplication by seed and leafcuttings.

Sources

CASPER, S.J. 1966: Monographie der Gattung Pinguiclua L. Bibl. Bot. 127/128.
HEGI, G. 1975: Illustrierte Flora v. Mitteleuropa. Berlin & Hamburg.
LLOYD, F.E. 1942: The Carnivorous plants. Waltham, Mass.
POLUNIN, O. 1987: Flowers of Greece and the Balkans. Oxford Univ. Press.
SCHLAUER, J. 1986: A world carnivorous plant list. CPN 15/3&4.
SCHNELL, D.E. 1976: Carnivorous Plants of the U.S. and Canada. J.F. Blair, N.C.
SLACK, A. 1980: Carnivorous plants. Dorset, England.

Map 1



Growing Heliamphora from the Venezuelan Tepui

By Andreas Wistuba (Mudauer Ring 227, 6800 Mannheim 52, West Germany)

The photographs accompanying this article were taken by me on a Venezuelan field trip in the spring of 1989. Joachim Nerz, Peter Harbarth and I stayed for about two months and we climbed Mt. Roraima, Mt. Kukenam and Ilu Tepui.

Besides numerous species of *Genlisea, Drosera* and *Utricularia*, we found *Heliamphora nutans, H. heterodoxa* and *H. ionasi*. These plants are shown in the pictures. *H. ionasi* is an especially impressive plant with giant pitchers up to 50 cm tall. I will never forget the moment we saw the first plants of this species!

Here are some growing hints for Heliamphoras that work for me. In nature, the genus never grows in sphagnum although there is sphagnum in the adjacent habitat. I would also not recommend growing them in sphagnum in culture. I use the following mix with great success:

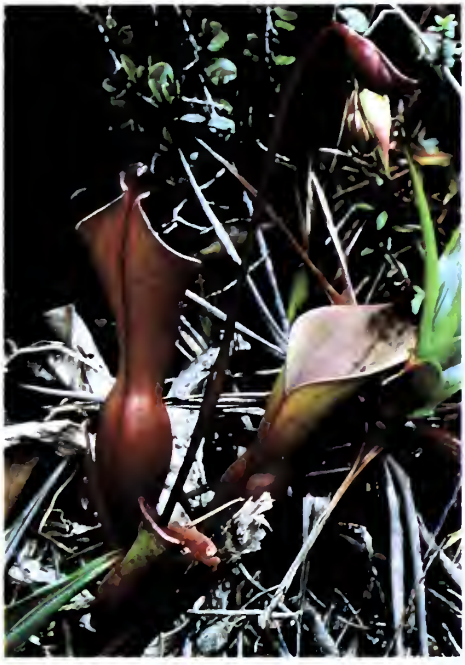
1 part cork
2 parts pine bark
2 parts meranti wood shavings
1 part polystyrene foam (fine grain)
1 part polystyrene foam (very coarse—"orchid chips")
1/2 part charcoal (fine grain)
1/2 part peat

We mix this well before using.

Heliamphoras require fertilizing! Mine grow very fast and produce beautiful pitchers when I give them foliar feedings with a fertilizer similar to Miracid. They will thank you by growing as fast as Sarracenias.

In fact, I use the same compost and fertilization for my *Nepenthes* which grow beside the Heliamphoras. As I am mainly interested in highland *Nepenthes* I keep a cool and humid climate in the greenhouse which is also ideal for Heliamphoras. Heliamphoras do best with cool nights, but day temperatures for them and the *Nepenthes* are not as critical. I shade only if the day temperature rise above 30°C. I use much light. Many people erroneously grow their Heliamphoras in deep shade. This only results in soft and ugly plants which do not resemble the colorful plants in nature. Try to adapt your plants to harder conditions and you will be surprised with their beauty. Heliamphoras benefit from water misting several times a day.

I have limited material for trade but will trade only for plants of comparable value.



H. nutans

H. ionasi and Author

Below: *Brocchinia reducta* swamp in the background
Mt. Kukenam and Roraima Tepui

A Field Trip to Northern Wisconsin

By Richard Shomin, 983 Barney, Flint, MI 48503, USA

Finding bogs in northern Wisconsin is easy and has become quite routine. Gary Thieme and I had an opportunity in late June and early July 1989 to hike this area for about ten days, and also two days in upper Michigan and part of lower Michigan.

Our bog finding record was nine bogs in one day, each in their own depression. The greatest density of bogs was in Prince, Oneida, Vilas, and Ashland counties. So bog rich is the area that a major cranberry firm farms some of the largest bog lakes. Most of these bogs are easily accessible and are on public land, namely the Chequamegon National Forest and Northern Highland American Legion State Forest. The best CP bogs were bog lakes. Near the edge of the water were the species one expects to find on this part of the continent—*Sarracenia purpurea, Drosera intermedia, Drosera rotundifolia*, and various Utricularias on the moss or in the water. Walking near the edge of bog lakes is dangerous. The floating moss can be unexpectedly thin, so each footstep is taken cautiously. All the bogs were dominated by black spruce and tamarack except near the water's edge. Some of the other non-CP were cranberry, leatherleaf, labrador tea, and the pink lady slipper.

Black Spruce - Tamarack Bog Pennty Lake Price Co. Wisc. Photo by Gary Thieme. (Figure 1)

P. vulgaris - Presque Isle Co. Mich. Growing on a rocky meadow. Photo by author. (Figure 2)

D. intermedia - massed on island Hummock - Penny Lake. Photo by author. (Figure 3)

3 species of CP on edge of a bog lake - *S. purpurea, D. intermedia*, yellow flower Utric. Mackinac Co. Mich. Photo by author. (Figure 4)

Figure 1

Figure 2

Figure 3

Figure 4

SPECIAL NOTE

Sarracenia rubra ssp. *Jonesii* Named to Endangered Status Under U.S. Endangered Species Act

By Donald Schnell (Rt. 1, Box 145C, Pulaksi, VA 24301)

On 30 September 1989, *Sarracenia rubra* ssp. *jonesii* was officially determined as endangered and added to the Endangered Species Act (1973) listing under the nomenclature above. (See: Federal Register, vol. 53, No. 190, pp. 38470-38474).

The Federal Register article written by Fish and Wildlife personnel of the US Dept. of the Interior is detailed and interesting reading. There is some discussion of the taxonomic difficulties aired over many years and the reason for selecting subspecies status (even though CITES listed the same populations as a species *Sarracenia jonesii* in 1981). There then follows a description of the plant and its habitat. Although 26 populations have been reported historically, only ten are extant, 4 in North Carolina in two mountain counties, and six in South Carolina. Only two of these ten populations are on public and thereby protectable land, and these are in South Carolina. There is some fear that recreational use and traffic on these public areas may actually endanger the small populations still further. The remaining populations are on private lands with no absolute protection other than state laws of limited extent and enforceability. These ten populations are quite small, one no more than 50 square feet. Current threats involve water table changes, change of land use, forest and brush overgrowth, and private and commercial collection. While this author has generally held that habitat destruction is the major consideration of threat to CP in general, I recognize that very small, limited populations are quite susceptible to irresponsible collector damage, especially massive commercial collections for certain European dealers. At this point, this taxon is not on the market.

The author of the Federal Register article concluded that eutrophication of sites proceeds so slowly that it is not an immediate factor. I would disagree with this. I have seen a very fine seep bog in piedmont North Carolina containing masses of *S. flava* and *S. purpurea* ssp. *venosa* along with hybrids go from an open, healthy area with a small central pond to wet brush and woods with only a few etiolated pitcher plants struggling on in less than 20 years. One of the better locations for ssp. *jonesii* in Henderson County, NC has gone from a beautiful, "healthy" active site to one severely threatened by brush and tree overgrowth shading in less than ten years. Part of the latter problem is an apparently misdirected attempt to protect the area from pasturing cows by fencing it off. Now the cattle do not keep down the weeds by feeding and trampling on them (They never consumed the pitcher plants and trampling on shallow rhizomes seemed to induce vegetative propagation).

As I have mentioned many times, I believe we must go to the private sector, particularly the Nature Conservacy, to seek some relief in these private land holdings. If the owners refuse outright sale or donation, they might agree to a preservation easement allowing designated and limited agents in to properly supervise and steward the site. While Nature Conservacy and some other conservation group consortiums do a fine job of acquisition, they prefer to turn the land over to a local, state or federal agency for stewardship as soon as possible. This is fine as long as the agency is able to wisely and informatively choose knowledgeable individuals to appropriately manage the sites. A local university professor—no disrespect intended—or agency biologists may not be those persons in spite of "credentials".

As an example of the latter, a recently preserved site for *S. oreophila* in Alabama was formerly a cow pasture. The cattle were removed and weeds flourished. In the actual seep site, there are a few counting stakes, and management thus far has consisted of clumsily felling one large tree which has been allowed to lie there, its trunk and branches covering pitcher plants! No attempt was even made to block the relatively narrow and crude drainage ditch leading from the seep. The tree could easily have been cut up and removed without excessive trampling damage or bringing heavy truckage into the seep itself. Of course this would have taken some time, thought and sweat.

I certainly concur with this step in preserving ssp. *jonesii* in principle, but it does little good to try and save a species or center attention on it solely without considering preserving and protecting an appropriately sized physiogeographic site, and then properly managing the site. I read too much of people bemoaning "enough is not known to actively manage a site" when in fact enough is known, often by common sense and dead reckoning alone, to at least hold it where it is in its trophic progress if not substantially reverse undesirable changes back toward an optimum condition.

Special Book Review

Lowrie, Allen. 1989. Carnivorous plants of Australia—Volume 2. University of Western Australia Press (Nedlands, Western Australia 6009). 202 pp. plus xxxvii.

Review by Donald Schnell

This is the second of a projected three volume series covering the carnivorous plants of Australia. Volume One dealt with the tuberous droseras, most of which occur in Western Australia. This volume covers all of the pygmy droseras, two non-pygmy, non-tuberous droseras, and finally three more tuberous droseras that had been defined since Volume One.

This series is a major effort on the part of the author, particularly in light of the confusion concerning droseras in Australia. The relatively few species recognized only a few years ago have exploded into many more. The reason for this, at least partially, lies in Australia's unique geography, particularly the central "outback". This is generally harsh, parched ponds. With the intervening large areas of nearly perpetually dry lands, we have a good example of island biology in a way, and the partial isolation of various populations in the islands of seasonal and rare permanent wetness encourages speciation and subspeciation. We have had large numbers of new plants temporarily named according to location found, and now most of this is cleared up through the research efforts of the author and others he acknowledges.

The book is available in both soft and hard cover and features a handsome photo of a pygmy *Drosera* on the cover. The paper is an excellent glaze, printing is sharp and clear, including the many color photos in the volume. After the usual brief prefaces, the book begins with a useful glossary, a type drawing of a typical pygmy *Drosera* with parts labeled, and a listing of the groups, species, and a complete key. A very unique and thoughtful section on the gemmae of these plants follows, which includes a key to the gemmae as well as a shaded illustration of each taxon's gemma. This reviewer had

not realized their uniqueness until now. There is a complete discussion of the life cycle of this group, and photos of typical habitats. The author then has a brief essay on the early Australian botanist James Drummond and his explorations of early Western Australia most of which was then known as Swan River Colony. Since this very broad site identification was often the only one on Drummond's early collections and descriptions, it makes for difficult follow-up today.

The bulk of the book descriptions and discussions of species and subspecific taxa. The form of Volume One is followed here. The first of four pages devoted to each taxon or hybrid is a complete botanical description along with habitat, location, and a brief paragraph of discussion points. The second page is a full sized botanical drawing of the taxon, including the entire plant in flower and magnified portions of specific parts. The third page is mostly occupied by a range map, and at the bottom is a key to the color photographic figures on the fourth page, these numbering on average from three to five per taxon.

The descriptions are all excellent, as are the line drawings and range maps. The photos are true to color, sharply printed, and for the most part show what they are intended to. The closeup photography which many of these tiny subjects require is good, but in a few cases some cropping in litho with increased enlargement may have been helpful since when the photos are five to a page, small reproductions of some tend to obscure intended demonstration of details mentioned in legends. I like this uniform presentation format, particularly the full sized botanical drawings and large range maps which an editor might have been tempted to reduce in the interest of saving pages.

The book concludes with a bibliography which appears complete, and an index. I might mention two items which some might question. The first concerns the author's featuring some taxa that have not yet been formally described in the botanical literature. These are clearly indicated right after the taxon's name on the description page of each set, and is actually acceptable under ICBN rules. One might ask why the author simply did not just go ahead with the description and be done with it, but this is not the format of the book, and apparently he was courteously and ethically bowing to botanists who have prior claim to the formal description. Secondly, some might object to the additional tuberous droseras being "tagged on to the end" of this volume. Since several years have lapsed between volumes and taxonomy of Australian droseras is moving so fast, these were actually "new" since the last volume. Personally, I would rather see them in the series and not left out because they seem out of place. One suggestion that might me helpful would be in addition to a volume three index when that volume appears, they also print a complete index for all three volumes.

I strongly recommend this series be added to all personal CP libraries. It is a valuable work. Prices vary depending on where the book is purchased, whether hard or soft cover (the latter is quite sturdy), and the differential between the Australian dollar and other currencies. Write the publisher (address in heading) for information. In the United States and Canada, the book can be purchased from International Specialized Book Service, Inc., 5602 NE Hassalo Street, Portland, OR 97213-3640 (telephone 503/287-3093). Again, write or call for prices within those two countries. In the UK, the agent is Peter Moore, P.O. Box 66, 200a Perne Road, Cambridge CB1 3PD England.

Special Book Review

Taylor, Peter. 1989. The genus *Utricularia*—A taxonomic monograph. Kew Bulletin Additional Series XIV. HMSO, P.O. Box 276, London SW8 5DT. 724 p. plus xi. (includes 220 pages of line drawings and 8 halftone plates).

Review by Donald Schnell

Some may think me guilty of hyperbole after the following statement, but after careful consideration, I judge this to be the CP book publication event since Lloyd in 1942.

After forty years of backbreaking, sometimes heartbreaking, excruciatingly detailed and careful study of the genus *Utricularia* by this author, frequently working on his own time into nights and weekends, this is what we have been waiting for. The meticulous balance and perspective of studying many thousands of herbarium specimens and living plants *in situ* throughout the world range are all here. In a foreword, Kew Gardens Director Ghillean Prance notes that here we have the unusual complete taxonomic study (nowadays) of a large and complex genus, but also a genus which is global in extent. The author urged more collections of complete plants and multiple specimens of a taxon in liquid fixatives after struggling with hastily prepared, often incomplete dried herbarium specimens of earlier days.

I do not think there is a serious student of CP who is unfamiliar with Pete Taylor's work over the years, the shorter regional monographs, papers describing new species or realigning old taxa, contributions to regional flora throughout the world—Now we have it all together here in one volume. And of course, the familiar carefully executed and extremely helpful Taylor line drawings, always with at least one per page at x 1, and then other plant parts at various magnifications on the page to show important taxonomic points. There is at least one page of drawings for each species—220 pages in all of multiple line drawings per page for the 214 species recognized.

Before getting to some specific examples for comment, the book is soft cover but strongly manufactured. Paper and printing are excellent as is the line drawing and halftone work. There is a complete bibliography and index. I find the author's writing style to be particularly refreshing these days of stilted academic conformity. One word follows another in a kind of inevitable way that makes for easy reading and comprehension. Where appropriate, the author admits his doubts and reservations about some taxa and points out where more work is needed by others to follow. There is even humor. In the section where Taylor implores field collectors to use a proper preservative liquid as well as the inevitable pressed specimen, he describes the preferred formula that should be at hand in the field for immediate fixation, but "In an emergency any potable spirit will do if the collector is prepared to make the sacrifice."

After a short preface (where the author makes acknowledgements, but generously continues with acknowledgements by name throughout the text), there is a very complete 56 page introduction. Here, the author goes into some detail explaining his taxonomic guidelines, and the morphology and anatomy of the genus as pertains to taxonomy and to some extent evolution. Early on, we are told that there will be no subspecific taxa in keeping with the recognized variability within species that is somewhat continuous with nature. *Polypompholyx* is reduced to a subgeneric section, one of the 35 total sections he uses.

The bulk of the introduction features discussions of each morphologic structure, vegetative and floral, and the variation among the species. This part makes particularly interesting reading because here we see a broad overview of taxonomic viewpoints in this very large genus, and we get to see several plant species listed for each morphologic feature for comparison, and this alone is fascinating in many cases. There are line drawing pages of bifid and quadrifid internal bladder gland configurations for comparison, and halftones of seeds and seed surfaces by SEM. There is also a page of line drawings of capsular dehiscence patterns. Even if one uses the rest of the book for reference only, the introduction should be read completely.

One of the interesting features is the author's decision on what to finally call those non-trap vegetative organs of utricularias that botanists have tapdanced around for years. We have heard photosynthetic organs, phyllodiform organs, foliar organs, etc. The author quite simply and practically settles on—leaves. And why not? While some anatomic and morphologic purists may grumble and rumble, this is a special genus with special structural variation, and a call for practicality helps.

The introduction concludes with ecology, evolutionary comments, instructions on collecting useful specimens, and a regional distribution list of all 214 species which shows some interesting world regional patterns.

Next, we have the keys, with the thoughtful use of keys by geographic region. They key characters are quite useful—especially if you have read the introduction and have some familiarity with Utricularias—and I was able to follow the keys down to species I grow in my greenhouse with no difficulty.

The remainder of the book then deals with the 214 species, each individually described in detail including history, synonymy, a list of illustrations in the literature, a detailed botanical description, a general discussion of comparative and other details, and at least one full page of line drawings. The combination *U. olivacea* is at last made, and in reference to some other American concerns, *U. radiata* and *U. inflata* are clearly listed as two separate species. The author mentions that in many photos in other publications one or the other is mislabeled (I have indeed noticed that photos of what is clearly *U. radiata* are presented as *U. inflata* in many CP picture books and magazine articles). Due to taxonomic priority, what we have called *U. fibrosa* here in the U.S. is more properly *U. striata*, and of course we must begin calling *U. macrorhiza* what we have been calling *U. vulgaris* in America. I am sure ICPS members in other countries will note changes pertinent to them also.

I can recommend this book without reservation, and it should be in the personal library of all serious CP students, especially those who are working with utricularias at all.

The costs of the book in the UK is 40 pounds sterling and is available surface postage paid from the address in the heading of this review, or through The Kew Shop, Royal Botanic Gardens, Kew, Richmond, Surrey TW9 3AB England. For those dealing in other currencies, there is a bank conversion charge in the UK. If you have a Visa or Mastercard, these are accepted internationally and are the best route to go. In the United States or Canada, the book may be obtained from Unipub, 4611F Assembly Drive, Lanham, MD 20706-4391 (telephone 301/459-7666). The price here is $81.00 US plus postage, and they will not stock the book but order them from England as requests come in.

Literature Review

Boesewinkel, F.D., Ovule and seed development in *Droseraceae*. Acta Bot. Neerl. 38(3): 295-312. 1989.

The differences in the seed coat of *Dionaea, Aldrovanda, Drosera* and *Drosophyllum* are mainly due to variations in the differentiation of the testa. After analysis, the author concludes that from just the point of view of seed anatomy, these four genera are correctly placed in the *Droseraceae*.

Caniato, R., R. Filippini and E. M. Cappelletti. Naphthoquinone contents of cultivated *Drosera* species *D. binata, D. binata var. dichotoma*, and *D. capensis*. Int. J. Crude Drug Res. 27(3): 129-136. 1989.

The Australian species of *D. binata* and *D. binata var dichotoma* are good natural sources of plumbagin, the only quinone occurring in these species. *D. capensis* is a good natural source of 7-methyljuglone, the only naphthoquinone occurring in all the plant organs.

Friday, L. E., Rapid turnover of traps in *Utricularia vulgaris* L. Oecologia (Berl) 80(2): 272-277. 1989.

In observing this species growing at Wicken Fen, England, a new group of leaves bearing many traps were produced at the rate of 1.4-2.8 groups a day from April to September. Survival was 50 days but trapping efficiency of bladders was greatest between 1-6 days of age and declined rapidly afterwards. A few traps 19 days old still could capture prey but overall the lifespan of the traps was related to size and position on the leaves.

Fromm-Trinta, E. *Genlisea lobata* Fromm-Trinta: A new species for the genus *Genlisea* St.-Hil. Section *Tayloria (Lentibulariaceae)*.

This new species of *Genlisea* is allied to *G. violacea* St.-Hil. from which it differs by the lobes of the corolla and other characters.

Hodick, D. & A. Sievers. On the mechanism of trap closure of venus flytrap (*Dionaea muscipula* Ellis). Planta (Berl) 179(1): 32-42. 1989.

Various experiments have explained the rapid closure of *Dionaea* traps by either a loss of turgor pressure of the upper epidermis, which should become flexible, or a sudden acid-induced wall loosening of the motor cells. These authors object to both explanations. On the first explanation, after trap closure, experimental results indicate that upper epidermal cells retain a considerable cell sap osmolality, which equals the value found in the mesophyll cells. On the second explanation, a sudden cell-wall acidification causing movement is improbable since an acidification of the apoplast from pH 6 to pH 4 reduces the action-potential amplitudes by 33% which is in

contrast to the measureed amplitude from the mesophyll and lower epidermis. If traps are incised several times from margin to midrib, a buffer of pH 6 added here does not stop trap movement. Even an alkaline buffer of pH 9 does not prevent extension of the mesophyll and movement in the traps. The authors theorize that mesophyll cells are kept compressed in the open trap developing a tissue tension. Lanthanium ions can paralyze the traps preventing mesophyll cell extension. By conducting stretching experiments on leaf strips with and without inhibitor, the authors conclude that cell walls of the upper epidermis and an adjacent mesophyll layer are the only cell walls with preferential microfibril orientation in the direction of the applied stress.

Kelly, M. S., Distribution and biomass of aquatic macrophytes in an abandoned nuclear cooling reservoir. Aquat. Bot. 35(2): 133-152. 1989.

An abandoned reactor cooling reservoir on the Savannah River Plant, S. Carolina was studied after 24 years. It was colonized by four floating species of plants with 32% of the biomass being *Utricularia floridiana* Nash and had the greatest standing crop in May. The low conductivity and slightly acidic water chemistry are important factors in the establishment of macrophyte species.

Lancelle, S. A. & P. K. Hepler. Immunogold labeling of action on sections of freeze-substituted plant cells. Protoplasma 150(1): 72-74. 1989.

The authors found the muscle protein actin in the pollen tubes of *Nicotiana* and the tentacles of *Drosera* species using monoclonal antibody specific for this protein.

Richter, U. Scanning electron microscopic observations on the bladders of *Utricularia reniformis* and *U. sandersonii*. Beitr. Biol. Pflanz 64(2): 167-184. 1989.

The distribution and grouping of different hairs showed differences between the velum of *U. reniformis* and the pavement epithelium of *U. sandersonii*.

Sivas, R. G. and J. F. Brown. Yeasts associated with fluid in pitchers of *Nepenthes*. Mycol. Res. 93(1): 96-100. 1989.

Nepenthes pitcher contents were studied in Australian cultivated plants and West Malaysian species. The dominant yeast type was *Cryptococcus albidus* with eight other species present in more or less abundance.

THE 1990 LIST OF CP BOOKS

Not available through CPN. Order directly from publisher, your local bookshop or C.P. Nursery.

☆ = Books intended primarily for children.
❑ = Books out-of-print.
▲ = No known supplier.

☆❑ 1. Animals & Plants that Trap by Phillip Goldstein. Holiday, 1974; Holiday House, Inc.: 18 E. 53rd St.; New York, NY 10022. $5.95.

2. Carnivorous Plant by Gordon Cheers. Globe Press. Melbourne. (ISBN 0-9591937-0-7)

3. Carnivorous Plant by Francis E. Lloyd. Peter Smith; 6 Lexington Ave., Magnolia, MA 01930; USA. 1942 ed. Paper $7.95 from Dover Publications; 31 E. 2nd St.; Mineola, NY 11501. (ISBN 0-486-23321-9)

4. Carnivorous Plants by Randall Schwartz. Avon Books, 1975; 959 Eighth Ave.; New York, NY 10019; USA. Soft cover $1.25 (ISBN 0-275-51580-X)

5. Carnivorous Plants by Adrian Slack. MIT Press, 1979; 28 Carleton St.; Cambridge, MA 02142; USA. 1980 ed. $28.00. 1984 paper $12.50. (ISBN 0-262-69089-6)

❑ 6. Carnivorous Plants by John F. Waters. Franklin Watt, Inc., 1974; 845 Third Ave.; New York, NY 10022; USA. $4.90.

☆ 7. Carnivorous Plants by Cynthia Overbeck. Lerner Publications, 1982; 241 First Ave.; Minneapolis, MN 55401; USA. Paperback $4.95. (ISBN 0-8225-9535-4)

8. Carnivorous Plants of Australia. Vol. I & II by Allen Lowrie. West Australia Univ. Press, 1986; Nedlands, WA 60009; AUSTRALIA. Or: International Specialized Books; 5602 NE Hassalo St.; Portland, OR 97213; USA. Paperback $32.50; hardback $45.00. Plus $2.25 UPS. (ISBN 0-85564-254-8)

9. Carnivorous Plans of the World by J. & P. Pietropaolo. Timber, 1986. Peter Pauls Nurseries; Canandaigua, NY 14424; USA. $30.30.

10. Common Marsh, Underwater & Floating Leaved Plants of the United States & Canada by Neil Hotchkiss. 1972. (Ed. Note: may be out-of-print).

11. CP of the US & Canada by D. E. Schnell. John F. Blair, Publisher, 1976. 1406 Plaza Dr., SW; Winston-Salem, NC 27103. 1976 ed. $9.50 + shipping. (ISBN 0-910244-90-1)

❑ 12. Cultivating Carnivorous Plants by Allen Swenson. Doubleday & Co., 1977; Garden City, NY 11535; USA. $7.95. (ISBN 0-385-11148-7)

☆❑ 13. Insect-Eating Plants by L. & G. Poole, T.Y. Crowell, 1963; 666 Fifth Ave.; New York, NY 10016; USA. $4.50

❑ 14. Insect-Eating Plants and How to Grow Them by Adrian Slack. 1986. (ISBN 0-295-96637-8)

15. Insectivorous Plants by Charles Darwin. AMS Press, 1893; 56 E. 13th St.; New York, NY 10003; USA; Vol. 12, 1972. $42.50. (ISBN 0-404-08412-5)

▲ 16. *Nepenthes* of Mt. Kinabalu (in English) by S. Kurata. Sabah National Park.

17. Pitcher Plans by Carol Lerner. William Morrow & Co.; New York. $12.95. (ISBN 0-688-01717-7)
18. Pitcher Plants of Peninsular Malaysia & Singapore by Roger G. Shivas. Maruzen Asia Pte. Ltd.; 51 Aver Rajah Crescent #07-09; Singapore 0531. $10.50. (ISBN 9971-954-16-8)
❑ 19. Plants of Prey in Australia by Rica Erickson. Univ. of W. A. Press, 1986.
☆❑ 20. Plants That Eat Animals by J. H. Prince. Lodestar Bks.; 2 Park Ave.; New York, NY 10016; USA; 1979 ed. $8.95.
21. The Carnivorous Plants by B. E. Juniper, R. J. Robins and D. M. Joel. Academic Press, Book Market Dept., 1250 Sixth Ave., San Diego, CA 92101. Tel. 1-314-528-8110. $150.00. (ISBN 0-12-392170-8)
22. The Genus *Utricularia*, a taxonomic monograph, KEW Bulletin, Series XIV, Royal Botanical Gardens. $68.00. (ISBN 0-11-250046-3) HMSO Publication Center, P.O. Box 276, London SW8 5DT, ENGLAND.

THE 1990 CP SOURCES

Note: All individuals or organizations selling, trading, or buying CP are advised to be cognizant of certain restrictions under the U.S. ESA and international CITIES for certain species (see editorial, CPN 12(1):3, 1983).

Name and Address	Catalog Price	Stock
Alain Christophe 37, Avenue Turgot Oxoir-la-Ferriere F-77330 France	$7s	S. African *Drosera* seed
Carolina Exotic Gardens Rt. 5, Box 283-A Greenville, NC 27834 USA	$1.00	*Darlingtonia, Dionaea, Drosera, Pinguicula, Sarracenia,* live *Sphagnum* moss
Cedar Ridge Nurseries R.D. #1, Cedar Ridge Road Allison Park, PA 15101 USA 412/443-9073	Free	*Nepenthes*
Charles Powell 2138 Harrison Street Santa Clara, CA 95050 USA	Inquire	

Cyril G. Brown 65 Highfield Cres. Hornchurch Exex. RM12 6PC ENGLAND		
Glasshouse Works Church Street, Box 97 Stewart, OH 45778 USA	Free	*Nepenthes*
Heldon Nurseries Ashbourne Road Spath Uttoxeter ST145AD ENGLAND		
Hinode-Kadan Nursery 2735 Nakanogo, Hacijyot Hachihyo-Island Tokyo 100-16	International Reply Coupon	*Byblis, Cephalotus, Drosers, Pinguicula, Nepenthes, Utricularia*
Hungry Plants 1216 Cooper Drive Raleigh, NC 27607 USA	$1.00	Tissue cultured plants
ISRA Exotics P.O. Box 1200 BSB Brunei: BORNEO	Free	*Nepenthes*
Lee's Botanical Gardens 12731 SW 14th Street Miami, FL 33184 USA 305/223-0496	Free	B-S-T all varieties of CP
Marie's Orchids & CP 6400 Cedarbrook Drive Pinellas Park, FL 34666 USA 813/546-7882	$1.00	*Heliamphora, Dionaea, Nepenthes, Cephalotus, Drosera, Pinguicula,* CP growing supplies, Tissue Culture Services
Milingimbi Nursery 69 Pringle Avenue Belrose NSW 2085 AUSTRALIA	Free	*Byblis, Cephalotus, Drosera, Dionaea, Nepenthes, Pinguicula, Sarracenia, Utricularia*
Nature et Paysages J. J. Labat, Empouchon Peyrusse-Massas F-32360 Jegun FRANCE	Inquire	All CP Families

Orgel's Orchids Rt. 2, Box K-6 Miami, FL 33187 USA 305/233-7168	Free	*Byblis, Dionaea, Drosera, Nepenthes, Pinguicula, Utricularia*
Peter Pauls Nurseries Canandaigua, NY 14424 USA 716/394-7397	Free	*Darlingtonia, Dionaea, Nepenthes,* seed, *Pinguicula, Sarracenia, Utricularia,* live *Sphagnum*
Renate Parsley 1, Woodlands Road Somerset West, 7130 REPUBLIC OF SOUTH AFRICA		Native CP seed
Roy Young 79, Pearcroft Road Leyton Stone London E11 44P ENGLAND 01/556-8048	1 International Reply Coupon	Seed of CP
Sarracenia Nurseries Links Side Courtland Avenue, Mill Hill London NW7 3BG ENGLAND		
South West Seeds Dough & Vivi Rowland 200 Springs Road Kempston, Bedford MK428ND ENGLAND		
Straits Aquariums Pts. Ltd. Lim Ah Pin Road, Box 626 Singapore 9154, SINGAPORE 48 17777 & 48 19911	Free	Maylaysian *Nepenthes*
Thysanotus-Seed-Mailorder Postfach 44-8109 Bremen 44 D-2800 WEST GERMANY	Inquire	*Byblis, Darlingtonia, Drosera, Drosophyllum, Nepenthes, Pinguicula, Sarracenia, Utricularia*

The co-editors and CPN do not endorse any of the above vendors. This is being provided only as a service to our subscribers. Information correct at time of receipt. Please contact sources directly for further information. Not responsible for omissions. Inquiries for inclusion in future lists should include a catalog/price list of CP available, cost of catalog and address. Send information to J. A. Mazrimas, 329 Helen Way, Livermore, CA 94550.

Special Announcement

A new cheap and easy way for CP growers (or anyone else) to communicate is computer electronic mail. One system I use is called bitnet. Bitnet is an electronic mail system that allows you to type letters and send them instantly to anyone in the world (even to other countries), so long as they also have a bitnet connection. If you are a university student, or are associated with a university, the system may be available to you. Many universities will give you a computer account for free, if so, there is no charge for using it. Thus far, I only know a few CP growers who are on the System. We'd like to get more people talking. If you are interested, try:

Michael Chamberland	ASMJC@ASUACAD.BITNET
Barry Meyers-Rice	Dunwich@solpl.as.arizona.edu
Rob Maharajh	Maharaj@mcmaster.bitnet

Special Notice

Bob Maharajh and Randy Lamb are undertaking serious research into the taxonmy of the *Drosera spathulata* "complex". I think that most growers of CP have dealt with sundews bearing this specific epithet followed by a location or form designation, and much confusion has arisen over the years. Bob and Randy will require either seed or plants of the species and would like to enlist the help of ICPS members. They are interested—for obvious reasons—only in material of verified geographical orgin. If you would like to participate by offering material, information, ideas, etc., write either Bob Maharajh (168 Dalewood Avenue South, Hamilton, Ontario, Canda L8S 1Z4) or Randy Lamb (4304 East Pender Street, Burnaby, British Columbia, Canada, V5C 2M6).

Larry Mellichamp (Biology Dept., UNCC, Charlotte, NC 28223) CPN INDEX AVAILABLE to volumes 7-18 (1978 through 1989). It is based on scientific names, illustrations, and detailed subject, with extensive cross-referencing to make it more useful. No authors names are included. 20 page manuscript printed on good paper. Cost: $3.00, includes postage and handling. Send cash or check to the above address.